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Retirement of Dr. S. P. Wiltshire

On 30 September 1956 Dr. S. P. Wiltshire retired from the post of director of the Commonwealth Mycological Institute, to the staff of which (then the Imperial Bureau of Mycology) he was appointed in 1922 from Long Ashton Research Station, University of Bristol, where he had done some notable research on apple scab and *Fusarium*. Later he became interested in the Dictyosporae and eventually undertook the determinations for the Institute of this difficult group, which led to the publication of his well-known paper on the foundation species of *Alternaria* and *Macrosporium*. He took a keen interest in herbarium technique and devised the method of preserving dried fungal cultures which has been of great benefit to numerous herbaria.

His long service in the advancement of mycological knowledge has brought him many personal friends, whilst mycologists and plant pathologists throughout the world hold him in high esteem for the advice he has always been ready to offer on the problems confronting them. He was an active member of learned societies and held the offices of vice-president of the Association of Applied Biologists in 1936 and president of the British Mycological Society in 1943. He was appointed director of the Imperial Mycological Institute in 1940 following the retirement of the late Mr. S. F. Ashby.

From the start Dr. Wiltshire correctly assessed the difficulties under which mycologists and plant pathologists in many parts of the world were forced to work and devoted himself to supplying their needs by publications from the Institute. Of first importance he placed the *Review of Applied Mycology*, and by his personal supervision of this journal has raised it to a level of indispensability for all serious workers in the subject. Throughout his whole period of service as editor he personally marked all incoming journals for abstraction and read the final proofs.

In addition to the abstract journal, he initiated a number of regular periodicals, including the *Review of Medical & Veterinary Mycology*, *Bibliography of Systematic Mycology*, *Commonwealth Phytopathological News*, and the *Index of Fungi*, the last-named recording every new species of fungus published from 'Saccardo' to the present day. In 1942 he commenced a series of maps of the distribution of plant diseases, which have been of great value to officers responsible for plant quarantine services.

During the difficult war years he not only maintained the work of the Institute at its recognized high level but succeeded in expanding its services to the enhancement of Commonwealth agriculture.

A fitting tribute to his long and devoted service is embodied in the fine new extension to the Institute, which was opened last year by H.R.H. the Duke of Edinburgh.

Dr. Wiltshire is succeeded by Dr. J. C. F. Hopkins, who was appointed assistant editor at the Institute in 1953 after 30 years' service in the West Indies, Uganda and Southern Rhodesia, in the last-named of which he was formerly Chief Botanist and Plant Pathologist.

(*Signed*) J. E. C. COVENTRY,

Chairman, Executive Council
Commonwealth Agricultural Bureaux

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ISOGAI (Y.). **Studies on the growth promoting agents separated from etiolated Bean seedlings. I. Separation of a substance promoting the growth of Aspergillus niger.**—*Sci. Pap. Coll. gen. Educ. Univ. Tokyo*, 5, 2, pp. 139–147, 1955.

At the Biological Institute, College of General Education, University of Tokyo, an oily, yellow substance isolated from etiolated beans (*Phaseolus viridissimus*) inhibited the antibiotic activity of decanoylacetoaldehyde and promoted the growth of *Aspergillus niger*.

JERMYN (M. A.). **Fungal cellulases. IV. Production and purification of an extracellular β-glucosidase of Stachybotrys atra. V. Enzymic properties of Stachybotrys atra β-glucosidase. VI. Substrate and inhibitor specificity of the β-glucosidase of Stachybotrys atra.**—*Aust. J. biol. Sci.*, 8, 4, pp. 541–562; 563–576; 577–602, 37 graphs, 1955.

In No. IV of these further contributions to the present series [*R.A.M.*, 32, p. 583] the author shows that the accumulation of β-glucosidase in shake cultures of *Stachybotrys atra* depends on a number of physiological conditions, though there was no evidence that it is induced by the presence of β-glucosides in the medium. One strain of the mould requires a factor present in yeast extract for the production of the enzyme.

Part V describes studies on the effect of enzyme and substrate concentration, pH, temperature, and the nature and concentration of added salts on the activity of the β-glucosidase, and its inactivation by heat and acid.

In paper VI the author describes tests of compounds as substrates for the enzyme. It appears to be specific for β-glucosides. It is concluded that there are at least two types of binding centre in the enzyme molecule. The nature of the complex between enzyme, substrate, and third molecular species is fully discussed.

HIRATA (S.). **Studies on the phytohormon in the malformed portion of the diseased plants. I. The relation between the growth rate and the amount of free auxin in the fungous galls and virus-infected plants.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 33–38, 1954. [Japanese, with English summary.]

The writer compared the amount of free auxin in the sap of healthy tissue and that from two virus-infected plants and 11 with fungus-induced galls by Went's method, replacing the excised tips of oat coleoptiles with agar pieces impregnated with the sap. Gall tissues, including those of *Albugo candida* [*Cystopus candidus*] on rape (Natane) and *Exobasidium camelliae* on *Camellia*, appeared to contain more and radish infected by mosaic and potato with crinkle viruses less free auxin than corresponding healthy tissue. It was concluded that the amount of hypertrophy or dwarfing caused by the viruses or fungi was correlated with the amount of free auxin in the tissues.

GARRETT (S. D.). **Rhizomorph behaviour in Armillaria mellea (Vahl) Quél. II. Logistics of infection.**—*Ann. Bot., Lond.*, N.S., 20, 78, pp. 193–209, 1956.

In further studies at the Botany School, University of Cambridge, on *Armillaria mellea* [*R.A.M.*, 32, p. 332] rhizomorphs grew out in all directions from woody inocula (fragments of *Salix alba* infected in maize meal-sand cultures) grown in conical flasks and held at 25° C., within a few weeks of burial in moist Cambridge loam, but no outward growth occurred when the inocula were buried in quartz sand. Growth through tubes of soil adjusted to 40, 60, and 80 per cent. moisture holding capacity was characterized by a progressive decline in weekly growth increments. As the initial growth rate was related to the size of the inoculum the subsequent decline was attributed partly to depletion of nutrient reserves in the inoculum through respiration and growth of the fungus and partly to competition for nutrients between the main growing apex and its subordinate branch apices. In the same way competition for nutrients may occur between late-formed rhizomorphs and those first produced from the inoculum.

The relation of these observations to the results of experiments where *A. mellea* was allowed to grow from soil tubes into sound potato tubers held below the tubes of soil is discussed. The speed of infection by the rhizomorphs increased with the size of the inoculum and decreased as the distance between inoculum and tubers increased. Statistical analysis of the data revealed a highly significant correlation ($P < 0{\cdot}001$) between the effects of these two variables on infection. When the inoculum potential of *A. mellea* was low the advance into the host tissues was retarded by host resistance, the infection being generally overtaken by soft-rotting bacteria which occupied the rest of the tuber and arrested any further fungus development.

ZACHOS (D. G.). **Évaluation du pouvoir infectieux du virus X de la Pomme de terre et du virus de la mosaïque du Tabac par la méthode des lésions locales.** [Evaluation of the infective ability of Potato virus X and Tobacco mosaic virus by the local lesion method.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 6, 1, pp. 61–88, 4 figs., 3 graphs, 1955.

At the National School of Agriculture, Grignon, France, *Gomphrena globosa* was used as the test plant for potato virus X (isolate from Arran Banner maintained in tobacco) and *Nicotiana glutinosa* for tobacco mosaic virus (maintained in tobacco), Spencer and Price's method for local lesion testing [*R.A.M.*, 22, p. 376], schema I, being employed in every experiment. This method permits the comparison of two virus specimens, each at two different dilutions, on one pair of leaves [cf. 25, p. 326]. Sap from macerated leaves, clarified by centrifuging, constituted the standard inoculum. The 'unknown' solution was a dilution of the standard with distilled water. With virus X the dilutions used were chiefly $10^{-1{\cdot}7}$ and $10^{-2{\cdot}7}$, but in some experiments they were 10^{-1} and 10^{-2} or 10^{-2} and 10^{-3}; the dilutions of tobacco mosaic virus used were 10^{-2} and 10^{-3}.

The inoculation method devised to ensure that the number of lesions per unit area of leaf surface was as constant as possible was to apply the inoculum to a flat piece of commercial glass-paper (C.E.T.A. no. I), and invert on the leaf with controlled pressure, one piece for each half leaf.

The activity of the unknown solution in relation to the standard was calculated by the methods of Spencer and Price [loc. cit.] and Price and Spencer [23, p. 152], from $\log M = \frac{d\,I\,\Sigma\,(x)^2}{b\,N}$, where M is the ratio of the infective ability of the unknown to that of the standard, d the factor of the difference of activity between the standard and the unknown, b the factor of the slope of the curve of the combined dilution, x the coefficients of b, I the interval between the logarithms of the dilutions, and N the number of dilutions for both specimens.

Using these methods and 64 half leaves on 16 plants for each virus, 20 experiments were made with each. The results showed that it was possible to evaluate the differences between the activity of two specimens with a precision allowing an average error of only 8 per cent. The important features contributing to a uniform result appear to be the slope of the dilution curve and the inoculation method. A very slight change in the number of lesions [cf. 35, p. 272] is capable of causing a considerable difference in the proportion of the calculated activity. *G. globosa* was satisfactory as a test plant, the best results being secured with dilutions that gave 10 to 23 lesions per half leaf. With *N. glutinosa* 32 to 74 lesions was the optimum range.

BERCKS (R.). **Über den serologischen Nachweis des Kartoffel-X-Virus.** [On the serological demonstration of Potato virus X.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 8, 3, pp. 40–41, 1956.

A simplified method for the demonstration of potato virus X in potato leaves is described from the Institute for Virus Serology, Brunswick, Germany [*R.A.M.*, 35, p. 333]. In laboratory tests the leaves were macerated with pincers and two drops of sap placed on a slide. To one was added an antiserum diluted 1 in 30 and to the other normal serum [cf. 34, p. 55]. Appraisal of the results with the naked eye followed after varying periods. As a control a further portion of sap was centrifuged and tested by the standard method [29, p. 377]. In material treated by the former procedure the virus could be demonstrated after 15 minutes in 72 per cent. of the samples of one variety examined and in 76 per cent. of another with latent infection; in a third variety the reactions did not develop until 30 to 45 minutes had elapsed, and then only in 59 per cent. of the samples.

In field experiments, taking the final appraisal after 10 minutes, an average reliability of 81 per cent. was demonstrated for three varieties.

Diagnosis was complicated both by the very variable coloration of the crude saps and their content of relatively coarse particles, and much better results were secured when the sap was not transferred immediately to the slides but only after standing for one to two hours, which not only expedited the development of the reactions but increased the reliability of diagnosis, e.g., from 67 to 94 and from 63 to 97 per cent. in two varieties.

To determine the detectability of low virus concentrations in crude saps, material from diseased plants was diluted with that of healthy ones by the simplified technique. In one variety the crude saps reacted on an average up to a dilution of 1 in 12 and the centrifuged, microscopically tested samples up to 1 in 67. In two other varieties the corresponding values were 1 in 10 and 1 in 86, respectively.

Since the maximum percentage of reliability attainable by the simplified method is only about 80 and low virus concentrations do not seem to come within its range, its use by breeders in general is not recommended. Experimental results to be published elsewhere have shown that potato virus X can spread fairly rapidly through a stand from a low initial degree of infection, necessitating the inclusion of as many plants as possible in a trial. It is considered advisable, therefore, to proceed with the established method in future.

DAY (M. F.). **The mechanism of the transmission of Potato leaf roll virus by aphids.** —*Aust. J. biol. Sci.*, 8, 4, pp. 498–513, 1955.

In studies at the Division of Entomology, Commonwealth Scientific and Industrial Research Organization, Canberra, on the transmission of potato leaf roll virus by *Myzus persicae*, using *Physalis floridana* as indicator [*R.A.M.*, 34, p. 279], it was demonstrated that moulting did not make the aphids non-infective [10, p. 747]. The virus could be recovered from the haemolymph, and infectivity was retained for at least a week, during which time the aphid could infect numerous

plants. *M. persicae* was a much more efficient vector than *Macrosiphum euphorbiae*. There was evidence that the virus multiplied to some extent in *Myzus persicae*. When *M. persicae* was fed on a plant containing a low concentration of the virus, there was usually a latent period of approximately 20 hours at 25° C. between the acquisition feed and a successful inoculation feed; when, however, the vector was fed on a source of high virus concentration, occasional transmission was obtained with a latent period of only a few hours. No clonal differences in vector efficiency were noted, and there was no evidence of the presence in Australia of two potato leaf roll viruses with different vector relationships.

It is concluded that potato leaf roll virus is not a 'vector-direct' virus [34, p. 514]. The differences reported from time to time on the occurrence of a latent period are explained mainly by differences in the vectors employed, in conjunction with the efficient source plants, *P. floridana* and *Datura tatula*, used by recent investigators. The latent period is the time required for the virus to move from the midgut to the saliva of the vector. When the quantity of virus ingested is small, enough to reach the saliva is not available until multiplication has occurred. When a large amount is ingested, some may occasionally reach the saliva before multiplication has occurred. The barriers between midgut and saliva may, however, differ in effectiveness as between different strains of aphids, and even with sources of comparatively high virus concentration, sufficient virus to reach the saliva may not be ingested in those strains in which a latent period can be demonstrated.

KRISTENSEN (H. R.). **Kartoffel virus S.** [Potato virus S.]—Reprinted from *Ugeskr. Landm.*, *1956*, 24, 4 pp., 2 figs., 1956. [English summary.]

Following a survey of the available information on the geographical distribution of potato virus S [*R.A.M.*, 35, p. 482], the author reports its detection by serological methods in 43 of the 69 varieties examined in Denmark since 1954. By means of agglutination numerous samples can be tested in a short time, and it is planned to apply this procedure in combined assays for viruses X and S.

FUKUSHI (T.), SHIKATA (E.), SHIODA (H.), SEKIYAMA (E.), TANAKA (I.), OSHIMA (N.), & NISHIO (Y.). **Studies on the insect transmission of Potato witches' broom.**—*Mem. Fac. Agric. Hokkaido Univ.*, 2, 3, pp. 52–61, 1 pl., 1955. [Japanese, with English summary.]

The information in this paper has already been noticed from another source [*R.A.M.*, 35, p. 483 and next abstract].

FUKUSHI (T.) & SHIKATA (E.). **Transmission of Potato witches' broom by the Dodders, Cuscuta japonica Chois. and C. chinensis Lam.**—*Mem. Fac. Agric. Hokkaido Univ.*, 2, 3, pp. 47–51, 1 fig., 1955. [Japanese, with English summary.]

Potato witches' broom virus [see preceding abstract] was successfully transmitted from infected to healthy potato plants by *Cuscuta japonica* and *C. chinensis*, and to red clover plants by *C. chinensis*. The incubation period of the virus so transmitted was very long, and symptoms appeared in potato only when tubers from infected plants sprouted the following year.

KEARNS (H. G. H.) & MORGAN (N. G.). **Small-volume air-flow spraying for the control of Potato blight.**—*Rep. agric. hort. Res. Sta. Bristol, 1954*, pp. 169–170 [1955].

The small-volume, air-flow mist sprayer used in fungicidal field trials at Long Ashton Research Station, Bristol [*R.A.M.*, 31, p. 194; 35, p. 692], proved effective for the control of potato blight [*Phytophthora infestans*]. When a proprietary basic copper carbonate (0·88 per cent. copper) was applied to eight-row blocks of potatoes

from two opposite sides twice in July and twice in August at 10 gals. per acre, infection in September was reduced from approximately 95 (in the unsprayed) to between 5 and 25 per cent. The necessity for spraying from two directions needs further investigation, and the use of larger air outputs should reduce operational time, increase the effective swath width (about eight rows in this experiment), and reduce mechanical damage to the crop. It was found that the air stream moved the foliage of the haulms and deposited the fungicide effectively on the lower surface of the leaf.

De Lint (M. M.). **Bestrijdingsproeven in 1955 tegen de Aardappelziekte (Phytophthora infestans (Mont.) de Bary).** [Control experiments in 1955 against Potato blight (*Phytophthora infestans* (Mont.) de Bary).]—*Landbouwvoorlichting*, 13, 6, pp. 328–336, 3 figs., 1956.

As in 1954, tests in 1955 again demonstrated the inferiority of zineb to copper compounds for the control of potato blight (*Phytophthora infestans*) on the Bintje variety growing on clay and moisture-retaining sandy soils in Holland, where the incidence of tuber rot tends to be high [*R.A.M.*, 35, p. 38]. Chemical haulm-killing was adjudged, from the results of a trial on Eigenheimers, to be unprofitable on a dry sandy soil. In a preliminary test on the resistant Regent variety, spraying with zineb raised the tuber yield from 431·5 kg. per are [119·6 sq. yds.] on untreated plots to 461·6 kg. while copper reduced it to 417 kg.

Houghland (G. V. C.) & Cash (Lilian C.). **Some physiological aspects of the Potato scab problem. I. Acidity and aluminium.**—*Amer. Potato J.*, 33, 3, pp. 86–91, 1 fig., 1956.

In culture tests on potato dextrose agar at Beltsville, Maryland [cf. *R.A.M.*, 34, p. 395], the growth of *Actinomyces scabies* [35, p. 223] was inhibited in the presence of aluminium in the form of organic salts at 100 p.p.m., and aluminium chloride at 160 p.p.m. Whenever *A. scabies* succeeded in growing it reduced the acidity of the medium (pH 4·7 and 6·3 to approximately 8 in 26 days). It is suggested that this tendency may explain the development of local patches of scab in fields with a pH of 4·8 to 5·2 [cf. 35, p. 484].

The 'soil-infestation' method [34, p. 174] was better than the use of scabby or inoculated potatoes for producing a uniform distribution of the disease in experimental plots. In an experiment comparing the effects of different amounts of aluminium sulphate on affected land over two seasons the highest application (800 lb. per acre) failed to achieve control, producing little or no reduction of soil pH.

Wagn (O.). **Kartoflens glas-råd.** [Glassy end of Potatoes.]—Reprinted from *Ugeskr. Landm.*, *1956*, 3 pp., 2 figs., 1956. [English summary.]

Bintje potato tubers from sandy soils in central Jutland, submitted for inspection to the State Phytopathological Service at the end of November, 1955, were found to be affected by glassy end [*R.A.M.*, 15, p. 821; 34, p. 812], here recorded for the first time in Denmark. The disorder was specially prevalent among crops liberally supplied with nitrogen, such as those following clover-grass. The rainfall in the affected area during the period from June to August was more than 100 mm. below the normal of 198 mm. Tuber analyses revealed 10·8 per cent. dry matter and 5·6 per cent. starch in glassy-end potatoes, compared with 18·1 and 12·7 per cent., respectively, in healthy ones.

Uritani (I.) & Akazawa (T.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 15. Inhibitory action of ipomeamarone on Ceratostomella fimbriata (2).**—*J. agric. chem. Soc. Japan*, 29, 2, pp. 148–151, 2 graphs, 1955. [Japanese, with English summary.]

In further work at Nagoya University, Japan [cf. *R.A.M.*, 34, p. 248 and follow-

ing abstracts], the addition of ipomeamarone [loc. cit.] in any concentration to cultures of *Ceratostomella* [*Ceratocystis*] *fimbriata* [35, p. 227] prevented the absorption and metabolism of inorganic phosphate. It is concluded that the resistance of sweet potato to *C. fimbriata* is due in part to the action of ipomeamarone in affected tissues acting as an uncoupler.

URITANI (I.) & MIYANO (M.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 16. Polyphenols in the rotten Sweet Potato. (3). Part 17. Polyphenols in the rotten Sweet Potato. (4).**—*J. agric. chem. Soc. Japan*, 29, 2, pp. 151–156, 6 graphs; 156–161, 4 graphs, 1955. [Japanese, with English summary.]

The information in these contributions to this series of studies [on *Ceratocystis fimbriata*: see preceding abstracts] has been noticed from another source [*R.A.M.*, 34, p. 541].

AKAZAWA (T.) & URITANI (I.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 19. Inhibitory effect of bitter substances in the rotten Sweet Potato on Ceratostomella fimbriata. Part 20. The respiratory increase, phosphate and nitrogen metabolism in the rotten Sweet Potato.**—*J. agric. chem. Soc. Japan*, 29, 5, pp. 377–381, 6 graphs; 381–386, 3 graphs, 1955. [Japanese, with English summary.]

In a further contribution to this series from Nagoya University, Japan [see preceding abstracts], it is reported that protein formation in the spores of *Ceratostomella* [*Ceratocystis*] *fimbriata* was inhibited by 50 per cent. by the addition of ipomeamarone (300 γ). It is concluded that the abnormal metabolite ipomeamarone contributes to the resistance of the sweet potato to *C. fimbriata*. Two other metabolites, ipomeanine and batatic acid, were tested for their effects on the phosphate metabolism of *C. fimbriata*, which was inhibited by the former only.

The respiration rate of sweet potato tissue adjoining that penetrated by *C. fimbriata* increased to twice that of uninfected controls and then decreased gradually. The addition of DNP [?diethyl p-nitrophenyl phosphate] increased respiration in inverse proportion to the increase brought about by *C. fimbriata*, indicating that adenosine diphosphate production was increased in sound tissue of rotted sweet potatoes. In the sound tissue inorganic phosphates and amino-acids decreased while organic phosphates and proteins increased, presumably due to activation of the anabolic system. Two to three days after penetration an increase in inorganic phosphate occurred, which was attributed to respiration uncoupled with phosphorylation.

ZIMMERMANN-GRIESS (SARA). **Further observations on the incidence of internal rust in Irish and American Potato varieties in Israel.**—*Ktavim* (*Rec. Agric. Res. Sta.* [*Rehovot*] *Israel*), 4, 2, pp. 17–19, 1956.

It has previously been noted from Israel that when tubers of the Arran Banner potato are subjected to high temperatures as a result of late planting in April and late lifting in mid-July they are badly affected by internal rust spot [*R.A.M.*, 28, p. 79].

Using Sebago and Katahdin (Canadian 'seed'), Arran Banner, Up to Date, Epicure, and Gladstone (Irish 'seed'), the author found that very late planting (end of May) and very late lifting (up to the end of August) did not increase the incidence of internal rust. Though Katahdin is very susceptible in the United States there were no rust spots in Israel. Comparison of seed tubers from the first, second, and sixth generations of Arran Banner suggested that acclimatization does not reduce the susceptibility of this variety to the condition.

ZIMMERMANN-GRIESS (SARA). **Keeping and planting qualities of sprouted seed Potatoes.**—*Ktavim* (*Rec. Agric. Res. Sta.* [*Rehovot*] *Israel*), 4, 2, pp. 21–23, 1956.

At the Agricultural Research Station, Rehovot, tubers which had sprouted in the soil before lifting and non-sprouted tubers were put into temporary storage and examined for rot after a week. All apparently sound tubers were then stored at 8° to 10° C. and 95 to 100 per cent. humidity. After 62, 162, and 218 days the percentages of sprouted tubers affected by dry rot (*Fusarium* sp.) were (with the corresponding figure for non-sprouted in brackets): 8·4 (1·8), 13·3 (6·3), and 8·3 (5), respectively, the sprouted tubers being the more susceptible.

Sprouted tubers which remained sound during storage were not inferior to normal tubers in their performance at spring and autumn plantings.

APPA RAO (A.). **The role of pH in nitrogen utilization by Piricularia oryzae.**—*Experientia*, 12, 6, pp. 215–216, 1956. [German summary.]

At the University Botany Laboratory, Madras, India, an isolate of *Piricularia oryzae* from rice failed to utilize the usual inorganic ammonium nitrogen sources but readily assimilated the nitrates in Richards's medium, supplemented by 5 μgm. thiamin [vitamin B_1] and 0·1 μgm. biotin [vitamin H] per 25 ml.

The poor growth on unsupplemented ammonium sulphate, resulting in a mycelial mat weight of only 27 mg. after 18 days' incubation, is attributed to a steep fall in the pH from 4 to 2·8. The corresponding weight for ammonium sulphate plus 0·5 per cent. succinic acid (final pH 4·6) was 165 mg., for ammonium carbonate (3·9) 142, for ammonium phosphate (3·6) 136, and for ammonium sulphate plus 0·4 per cent. calcium carbonate (6·3) 128. The maximum weights of 188 and 185 mg. were obtained with potassium nitrate and ammonium sulphate in ratios of 9·5 to 0·5 and 9 to 1 per cent., respectively (both at pH 3·9). With higher ratios of ammonium sulphate (2 to 7·5 per cent.) the mycelial weights fell to between 45 and 29 mg.

In the light of these findings the classification of fungi based on their utilization of different forms of nitrogen, proposed by Robbins (*Amer. J. Bot.*, 24, p. 243, 1937), may require modification, as already suggested by Brian *et al.* [*R.A.M.*, 27, p. 145].

COULTER (J. K.) & LOCKARD (R. G.). **Studies on penyakit merah of the Padi plant. I. The effect of N.P.K., lime and trace elements on the growth of Padi in penyakit merah soils and the uptake of these nutrients in pot experiments.**—*Malay. agric. J.*, 38, 3, pp. 151–162, 1 graph, 1955.

In Malaya at least two distinct sets of symptoms on rice are distinguished by the authors as 'penyakit merah' [see next abstract]. In one, small, dark brown spots near the tips of the older leaves enlarge and coalesce, and the whole leaf turns dark brown and dies. In the other, the tips of the older leaves turn yellow and the discoloration spreads down the lamina, the midrib remaining green. At this stage, the symptoms resemble those of phosphorus deficiency. Later, the yellow areas and the midrib turn orange and when one-half of the leaf has become affected it usually dies; the dead leaves are light brown. The first condition was seen in Malacca, Selangor, and Kelantan, and the second in Kedah, Perak, and Selangor. There was, however, no clear regional division between the two sets of symptoms, and both were occasionally present in the same field. The disorder sometimes causes almost complete loss of crop.

In pot experiments in 1953–4 the susceptible Beman variety responded markedly to phosphorus, applications improving plant growth and the uptake of the element in soils from both diseased and healthy areas. No other element appeared to have much effect. The disorder, it is thought, may possibly be due to several causes.

A phosphate level near the threshold value combined with poor growing conditions may cause some symptoms, but by the time they appear, it may be too late to effect a cure by applications of phosphorus.

Bandy (F. E.). **Rice hybridization in Malaya.**—*News Lett. int. Rice Comm.* 15, pp. 6–11. 1955.

The writer notes the occurrence of appreciable variation in susceptibility of local rice varieties in Malaya to 'penyakit merah' disease [*R.A.M.*, 34, pp. 671, 803, and preceding abstract]. Differences occurred both between and within families of local hybrids, marked cases of resistance being noted in progeny rows of Siam 29 × Bunyak Anak.

Takase (K.) & Kato (J.). **On the biochemical studies of the blast mould (Piricularia oryzae Cavara), the causative mould of the blast disease of the Rice plant. Part 2. Studies on the physiological action of piricularin, a toxin produced by the blast mould, on Rice plants.**—*J. agric. chem. Soc. Japan*, 29, 3, pp. 185–190, 3 figs., 1955. [Japanese, with English summary.]

In this further contribution from the Faculty of Agriculture, Nagoya University, Japan [*R.A.M.*, 34, p. 361], it is reported that the growth and respiration of rice plants were inhibited by piricularin [loc. cit.] at concentrations above 1 in 50,000 and promoted by concentrations below 1 in 1,000,000. Very dilute piricularin (1 in 1,000,000) increased the polyphenol content of rice plants, leading the authors to conclude that the polyphenol system plays an essential part in respiration. The inhibitory effect of piricularin was counteracted by the addition of chlorogenic acid but not by cystine.

Fujimori (R.) & Kaneda (M.). **Studies on the brown spot of Rice plant I. Sporulation on the diseased spot.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 115–119, 1 pl., 1955. [Japanese, with English summary.]

Conidiophores of the rice brown spot fungus (*Ophiobolus miyabeanus*, *R.A.M.*, 35, p. 329) are usually produced on the 'decomposed zone' when leaves are still vigorous, usually through stomata, the production zone extending greatly as the leaf ages and dies. They first appeared in a special culture cell [32, p. 450] after five to 14 hours and grew slowly at 18° to 20° C. in a moist atmosphere. The production of conidia is described and figured in a series of 19 photographs.

Baba (I.), Iwata (I.), Takahashi (T.), & Kitaura (A.). **Studies on the nutrition of Rice plant with reference to Helminthosporium leaf spot (Preliminary report). XI. Absorption and translocation of nutrients as influenced by soil moisture and air humidity.**—*Proc. Crop Sci. Soc. Japan*, 24, 1, pp. 169–172, 2 graphs, 1956. [Japanese, with English summary.]

In this further contribution [cf. *R.A.M.*, 34, p. 60, 35, p. 60, and following abstract] it is reported an increased susceptibility of rice to *Helminthosporium* [*Ophiobolus miyabeanus*] leaf spot under conditions of low soil moisture and high atmospheric humidity. It is concluded that the increased susceptibility is related to low ratios of silica and potassium to nitrogen in the leaf tissue.

Arai (S.) & Tatsuyama (H.). **Studies on Helminthosporium blight of Rice plants. XII. Influence of azo-pigments upon the metabolism of the causal fungus.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 11–14, 2 diags., 1954. [Japanese, with English summary.]

In a further contribution to this series [cf. preceding abstract] it is stated that in nutrient solutions containing minute amounts of congo red and thymidin the mycelial growth of *Cochliobolus* [*Ophiobolus*] *miyabeanus* [see following abstracts]

is accelerated and the uptake of glucose and nitrate increased. With larger amounts of the dyes this is reversed. Media containing these dyes decreased the pathogenicity of the fungus spores to rice plants.

AKAI (S.) & UEYAMA (A.). **On the catalase activity of diseased leaves of Rice plants infected by Cochliobolus miyabeanus.**—*Forest. Pl. Kyoto*, 5. 3. pp. 87–94. 3 graphs. 1955.

In further studies at Kyoto University, Japan, on the enzymatic activity of rice leaves inoculated with *Cochliobolus* [*Ophiobolus*] *miyabeanus* [*R.A.M.*, 33, p. 113 and preceding and following abstracts] the relative value of catalase activity (ratio of diseased to normal leaves) increased enormously up to 24 hours after inoculation of the susceptible Kyoto Asahi variety and then declined. When the activity of the enzyme in healthy and diseased leaves attained an almost identical level the small, necrotic lesions typical of infection by the fungus developed. There were marked changes in catalase activity of the foliage corresponding to the various growth periods of the host, with peaks at the stages of vigorous branching and earing. Enzymatic activity was more intensive in the leaves of the resistant Kameji variety than in those of the susceptible Magnarama and was uniformly higher in the foliage than in the stems and roots. Catalase activity was completely inhibited by mercuric chloride at a concentration of 10^{-3} M., the effect of copper sulphate [35, p. 229] at the same strength being only half as great. The addition of a 0·2 M solution of sodium silicate to the soil at 50 and 100 ml. per 2 in Wagner's pot accelerated catalase activity in both varieties.

AKAI (S.) & TANAKA (H.). **Change of the respiration and carbon-assimilation in leaves of Rice plants infected by Cochliobolus miyabeanus.**—*Forest. Pl. Kyoto*, 5. 3. pp. 95–104. 5 graphs. 1955.

In the course of 13 days both the respiration and photosynthesis of Magnarama rice leaves inoculated with *Cochliobolus* [*Ophiobolus*] *miyabeanus* [see preceding and next abstracts] increased as a result of infection, reaching a plateau on the fourth to sixth day and then generally declining. The ratio of photosynthesis to respiration in the inoculated leaves was slightly below 1 throughout the present study. In the initial phase of infection a constant correlation was maintained between the number of spots (at this stage not exceeding the tip of a needle in size) in the leaves and the respiration of the latter.

HASHIOKA (Y.) & ANNO (K.). **Phytopharmakologie der Reiskrankheiten. II. Organischer Quecksilberstaub als Blattfungizid bei Reispflanzungen.** [Phytopharmacology of Rice diseases. II. Organic mercury dust as a leaf fungicide in Rice plantations.]—*Hifthem-Berichte*, S. 4, pp. 189–194. 6 figs., 1955.

In further studies in the present series at the College of Agriculture, Gifu, Japan [*R.A.M.*, 32, p. 505], ceresan plus five times its weight of slaked lime and 3·9 per cent. made inhibited the germination of *Pyricularia oryzae* conidia on potato saccharose agar for two and five weeks, respectively. 11 per cent. copper dust and Bordeaux mixture (450 gm. copper sulphate and 900 gm. calcium oxide per 100 l. water) being less effective, though considerably reducing elongation of the germ-tubes and appressorial formation. All these chemicals and thiram, applied at a uniform dosage of 0·5 gm. per 10 slides, suppressed conidial germination of *Cochliobolus* [*Ophiobolus*] *miyabeanus* [see preceding and next abstracts].

Slaked lime cannot be replaced by kaolin, diatomaceous earth, or talc as a diluent for ceresan without impairment of efficiency against *P. oryzae*. In practice, the dust and diluent should be applied to the leaves in a ratio of 1:5, while one of 1:7·5 is recommended for the neck to obviate any risk of injury to the young panicles.

Thiram and ceresan, besides inhibiting sporulation of both pathogens, prevented their further extension, as also to a lesser extent did copper dust and a copper-mercury fungicide, but not zineb or Bordeaux mixture.

Akai (S.), Yasumori (H.), Oku (H.), & Tabuchi (T.). **On the influence of 2-methyl-1,4-naphthoquinone (vitamin K 3) upon the outbreak of Helminthosporium blight of Rice plants.**—*Forsch. Pflkr., Kyoto*, 5, 3, pp. 105–112, 1955. [Japanese, with English summary.]

The susceptibility of rice plants to the leaf spot caused by *Cochliobolus* [*Ophiobolus*] *miyabeanus* was substantially reduced in experiments at Kyoto University, Japan [see preceding and next abstracts], by immersion of the seeds for six to 48 hours in a 10^{-2}–2×10^{-2} per cent. vitamin K3 solution at 28° C. before growing in Wagner pots. Similar results were obtained by dipping seedling roots in the solution at a strength of 10^{-2}–$0{\cdot}5 \times 10^{-2}$ per cent. As a rule, the treatments were not followed by any adverse effects on growth or yield.

Kido (M.), Yanadori (S.), & Sato (T.). **Physiological and ecological researches on Rice plant grown on well-drained and ill-drained paddy fields. (2) On the degree of root-rot infestation and nutrient absorption in Rice plant.**—*Proc. Crop Sci. Soc. Japan*, 24, 3, pp. 161–162, 2 graphs, 1956. [Japanese, with English summary.]

At the Faculty of Agriculture, Niigata University, Japan, a low oxidation-reduction potential in the soil of badly drained paddy fields resulted in severe [unspecified] root rot [cf. *R.A.M.*, 34, p. 542] which in turn suppressed the absorption of nutrients.

Goto (K.), Inoue (Y.), Fukatsu (R.), & Ohata (K.). **Field observations on the outbreak and fluctuation of severity of bacterial leaf blight of Rice plant.**—*Bull. Div. Pl. Breed., Tokai-Kinki agric. exp. Sta.* 2, pp. 53–68, 1 fig., 2 diags., 4 graphs, 1955. [Japanese, with English summary.]

This paper reports observations on bacterial leaf blight (*Bacterium* [*Xanthomonas*] *oryzae*) [*R.A.M.*, 35, p. 547] of rice from 1950 to 1953 at the Tokai-Kinki Agricultural Experiment Station, Japan. The disease originates on the periphery of the leaves in wounds due to wind damage, and possibly also in those caused by thrips, and spreads along the margin and larger veins. In seedlings it appears towards the tips of the leaves. If it is present in the seed bed, it is worse in the field, primary infection then appearing on the lower leaves. It can also start after transplanting, infection then coming from weeds on which the pathogen overwinters [32, p. 506]. The more vigorous the crop, the more severe the disease. A combination of rainy weather, dull, windy days, and a temperature of 22° to 26° C. favours it. When typhoons occur it becomes widespread, otherwise it may be confined to small groups of plants, spreading upwards on these. Some varieties exhibit a degree of resistance under these latter conditions which is not maintained in the widespread epidemics after typhoons. Varietal resistance in seedlings is not always replicated in the field.

Seko (H.), Kato (I.), Samoto (K.), & Saigo (S.). **Morphological studies of 'akiochi' Rice plant. (1) On the growth aspect of 'akiochi' Rice plant.**

Seko (H.), Kato (I.), Samoto (K.), & Yamakawa (I.). **Morphological studies of 'akiochi' Rice plant. (2) On the feature of 'akiochi' Rice plant.**—*Bull. Div. Pl. Breed., Tokai-Kinki agric. exp. Sta.* 2, pp. 22–31, 6 graphs; pp. 32–40, 7 graphs, 1955. [Japanese, with English summary.]

From the results of a survey from 1948 to 1950 of nine varieties of rice growing on three soil types in Japan it is suggested that the initial good growth of akiochi

plants [*R.A.M.*, 34, p. 542] is due to decomposition of compost under prevailing high temperatures but that later in the season the oxidation-reduction potential drops and hydrogen sulphide is formed, damaging the roots and causing a check in growth.

The second paper deals with the morphological features of affected plants, the upper internodes of which are shorter and the flower heads smaller, with many abortive flowers.

Orsenigo (M.). **Effetto della nutrizione potassica del Riso sulla gravità del mal dello sclerozio (Leptosphaeria salvinii Catt.), sull'elmintosporiosi (Helminthosporium oryzae Breda de Haan) e sulla malattia detta 'white tip' (Aphelenchoides oryzae Yokoo), sia singolarmente che in combinazione sulle medesime piante.** [Effect of potassium nutrition of Rice on the severity of sclerotial disease (*Leptosphaeria salvinii* Catt.), helminthosporiosis (*Helminthosporium oryzae* Breda de Haan), and the disease termed 'white tip' (*Aphelenchoides oryzae* Yokoo), both singly and combined on the same plants.]—Reprinted from *Ann. Fac. Agr.* (*Pubbl. Univ. S. Cuore*, N.S., 51), pp. 8–21, 1955. [French and English summaries.]

When rice plants were grown in sand at low, medium, and high levels of potassium in the Department of Plant Pathology, University of Arkansas, Fayetteville, the deficient plants were stunted and had short panicles, the grains were light in weight, and there was a high percentage of sterility. Stem rot (*Leptosphaeria salvinii*) also caused a high percentage of sterility and reduced the height of plants and panicles, particularly with low potassium [*R.A.M.*, 34, p. 813]. Disease incidence decreased as the potassium level increased. Brown spot (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*] did not increase sterility, nor did the potassium level affect its severity except that kernel discoloration was rather more pronounced at the higher levels. However, sterility increased with combined infection of white tip (*Aphelenchoides oryzae*) and *O. miyabeanus*, kernel weight being reduced at all potassium levels.

Orsenigo (M.). **Relazioni dei funghi portati dal seme con le morie dei germinelli e con le alterazioni delle cariossidi del Riso.** [The relation of the fungi carried by the seed with seedling mortality and discoloration of the kernels in Rice.] —Reprinted from *Ann. Fac. Agr.* (*Pubbl. Univ. S. Cuore*, N.S., 51), pp. 22–33, 1955. [French and English summaries.]

At the University of Arkansas, Fayetteville, from 1951 to 1953, inoculation of rice seedlings growing in soil in the greenhouse by spraying or dipping the panicle in a spore suspension demonstrated that four *Fusarium* strains and a *Curvularia* sp. increased the percentage of discoloured kernels, but none of the isolates tested could penetrate the hull tissues. Sometimes the disorder known as pecky rice [*R.A.M.*, 30, p. 538] was caused by seed-borne fungi entering hulls that were incompletely closed or broken. *Curvularia* sp. was not pathogenic to the seedlings but *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] and all the *Fusarium* isolates tested were, the last-named being particularly active at low temperatures. At 28° C. *Fusarium* strain E caused symptoms of the disease known as 'bakanae' in Japan [*Gibberella fujikuroi*] where the optimum for their development is 35° [cf. 30, p. 342].

Wounds and their treatment.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S., 17, pp. 27–30, 2 figs., 1955.

Brief, practical directions are given for the treatment of wounds of *Hevea* rubber to protect them against attacks by insects and fungi. For stem wounds, where the chief concern is to promote rapid healing and produce a smooth surface easily

tapped at panel-level, crude petroleum jelly (petrolatum) in the form of Standard Vacuum product 2295–C or Shell Otina C is recommended. In full sunlight, however, it may melt and may also attract wild pig. A safe but less efficient alternative is an asphalt and kerosene mixture to which a wood preservative has been added; if exposed to the sun, the surface treated with this mixture should be whitewashed. Recommendations are also made for the treatment of damage caused by fire, lightning, and accidental sodium arsenite poisoning.

Srivastava (S. N. S.). **Two fungal infections of Hevea seeds.**—*Curr. Sci.*, 25, 5, pp. 157–158, 1956.

Botryodiplodia theobromae [*R.A.M.*, 34, p. 544] and *Phomopsis heveae* [28, p. 589] are reported from the Plant Quarantine Station, Madras, India, as having been found on *Hevea* rubber seeds imported from Malaya.

Hilton (R. N.). **South American leaf blight. A review of the literature relating to its depredations in South America, its threat to the Far East, and the methods available for its control.**—*J. Rubb. Res. Inst. Malaya*, 14, *Commun.* 293, pp. 287–337, 1 fig., 3 maps, 1955.

Basing his review mainly on the literature (105 references), the author describes the life-history of *Dothidella ulei* [*R.A.M.*, 34, pp. 397, 545] and gives a succinct account of the part played by the fungus in preventing the establishment of commercial rubber plantations in tropical America. Control methods involving quarantine, eradication, spraying, and the breeding of resistant material are reviewed, with special emphasis on the work carried out in this respect by the United States Department of Agriculture in co-operation with the countries of Latin America. The danger presented to the rubber-growing areas of Asia is assessed, and the steps taken by the countries concerned to exclude the disease or to eradicate or control it if necessary are described.

A hitherto unpublished Memorandum by R. A. Altson (1948) on the danger of the introduction of the disease into Malaya and the means available locally of coping with the menace is reproduced in full in an Appendix (pp. 338–354).

Aberdeen (J. E. C.). **Quantitative methods for estimating the distribution of soil fungi.**—*Pap. Dep. Bot. Univ. Qd*, 3, 11, pp. 83–96, 6 graphs, 1955.

In order to sample soil for the estimation of the contained fungi [cf. *R.A.M.*, 35, p. 326] at the Department of Botany, University of Queensland, the author devised a method by which brass plates of different thicknesses were bored with holes of varying diameter, then placed on a flat metal surface, and the soil samples pressed into the holes, the soil being smoothed off level with the plate. These samples of known volume were then shaken in a weak sterile agar solution (0·15 to 0·2 per cent.), to obtain even distribution of the particles, and plated. Rose-bengal (60 p.p.m.) was used as a bacteriostatic agent, the medium being a modified Czapek [29, p. 531] with the sugar reduced to 0·1 to 0·3 per cent.

In the subsequent analyses of the data obtained frequency percentages were used to develop a new method of estimating the average size and density of colonies or the volume of soil occupied by any one species. The species-volume curve was used to estimate the extent of aggregation for the whole community of fungi in a sample. For the quantitative estimation of soil fungi by colony counts the soil fragments must be thoroughly broken up to ensure that all mycelium is released, equal lengths of mycelium must on average give equal numbers of fragments, and sporulation must not occur. It is doubtful if these conditions ever obtain but the species giving the highest colony counts usually gave the highest frequency percentages, though it was not difficult to find exceptions.

Davey (C. B.) & Wilde (S. A.). **Determination of the numbers of soil micro-organisms by the use of molecular membrane filters.**—*Ecology*, 36. 4, pp. 760–761, 1 diag., 1955. [Received July, 1956.]

The special nitrocellulose molecular filters recently developed for removing micro-organisms from liquids have the advantage that they preclude lateral diffusion of colonies and are adaptable to large-scale production. Trials conducted by the authors in the Department of Soils, University of Wisconsin, Madison, have revealed that this method is applicable to microbiological soil analyses usually done by agar plate counts [see preceding abstract].

In order to evaluate the two methods samples of biologically active soil layers were analysed simultaneously, employing different dilutions and up to ten duplicate determinations. In the membrane method 100 ml. aliquot of the soil suspension was drawn through a filter in a sterilized stainless steel funnel by means of an electric vacuum pump. The filter was then transferred immediately to a sterile Petri dish containing an absorbent pad saturated with Albimi M peptone nutrient solution and incubated at 30° C., for 48 hours, the colonies being recorded by means of a microbiological counter. The results indicated that the filter membrane method is reproducible within far narrower limits than the agar plate method but the analyses are slower and the filters are rather expensive. Up to the present the selective media successfully employed have been (*a*) sterilized extract of a fine-textured hardwood soil, A_1 horizon, one volume of soil to nine of distilled water with 0·5 gm. potassium monhydrogen phosphate and 1 gm. glucose per l. or (*b*) Albimi peptone solution containing 40 gm. peptone, 6 gm. yeast autolysate, 3 gm. potassium monohydrogen phosphate, and 5 gm. sodium chloride per l. distilled water. The first solution favours fungus growth and the second that of bacteria.

Müller (Hannelore). **Untersuchungen über die Wirkung des Cyanamids im Kalkstickstoff auf pathogene und nichtpathogene Mikroorganismen des Bodens.** [Studies on the action of cyanamide in nitro-chalk on pathogenic and non-pathogenic soil micro-organisms.]—*Arch. Mikrobiol.*, 22. 3. pp. 285–306, 6 figs., 17 graphs, 1955.

Pure culture studies at the Plant Protection Institute, Stuttgart-Hohenheim, Germany, showed that the least sensitive of the fungi tested to the cyanamide component of nitro-chalk [cf. *R.A.M.*, 32. p. 540] were *Aspergillus* and *Penicillium* spp., *Fusarium nivale* [*Calonectria nivalis*] from rye, and an unidentified *F.* sp. of the Elegans group from cucumber [cf. 35, pp. 265, 704]. *Mucor* sp. and *Helminthosporium gramineum* from barley sustained rather more severe injury, while the growth of *Rhizoctonia* [*Corticium*] *solani* from potato and *Phoma betae* from beet was inhibited at a concentration of 0·14 per cent. and that of *Pythium debaryanum* from lupin, *Ophiobolus graminis* from wheat, and *Thielavia* [*Thielaviopsis*] *basicola* from cyclamen [33, p. 496; 34, p. 152] at 0·7.

The fact that the pathogens are, in general, so much more sensitive to the influence of cyanamide than the saprophytes offers hopeful prospects for its use as a soil disinfectant. Most of the experimental fungi developed hyphal deformities or changes in the cytoplasm as a result of contact with the chemical.

Muskat (J.). **Untersuchungen über Schimmelpilze bayrischer und tunesischer Böden. 1. Floristisch-ökologischer Teil. 2. Teil. Zur Physiologie (mit besonderer Berücksichtigung des Vorkommens von Gasvakuolen in Conidien).** [Studies on moulds of Bavarian and Tunisian soils. 1. Floristic-ecological part. Part 2. On the physiology (with special reference to the occurrence of gas vacuoles in conidia).]—*Arch. Mikrobiol.*, 22. 1. pp. 1–20. 21–44. 10 figs., 2 graphs, 1 map, 1955. [Received April, 1956.]

At the Botanical Institute of the University of Munich, Germany, 417 soil samples

(100 from Upper Bavaria, 12 from Eichstätt (central Franconia), and 303 from Tunisia) were analysed for their mould populations.

The Upper Bavarian contained on an average 100,000 spores per ml., the maximum number of species in any one sample being 11. *Penicillium* spp. were present in 90 per cent. of the samples, Fungi Imperfecti in 72, Mucorales in 43, and *Aspergillus* spp. in 39. The reaction of 29 per cent. of the samples was acid and that of 67 per cent. alkaline. Acidophilous genera comprised *Zygorrhynchus*, *Mucor*, and *Absidia*; *Cunninghamella*, *Rhizopus* (more especially), and the Fungi Imperfecti were found more commonly in an alkaline substratum, while the Aspergillaceae were equally distributed.

Species of *Absidia* predominated in the dry steppe-heathland soils of Eichstätt; the maximum number of Aspergillaceae was five.

All the Tunisian samples, even those containing a high proportion of salt, harboured moulds, including 28 species of Mucorales and numerous members of 42 genera of Fungi Imperfecti. The most prevalent species was *Aspergillus niger*, represented in 61 per cent. of the samples. As in Bavaria, the maximum number of species per sample was 11. *Penicillium* spp. were less frequent than in Bavaria but species of *Rhizopus* were particularly widespread. Mucorales and *Penicillium* were more commonly encountered in the humid-acid soils of the north, while *Aspergillus* and Fungi Imperfecti predominated in the hot, arid regions of the southern interior.

High concentrations of potassium chloride, sodium nitrate, and sodium chloride were just as toxic to the mycelia and spores of the Tunisian moulds as to the German.

In the second paper it is noted that gas vacuoles developed in the multicellular, thick-walled conidia of *Helminthosporium* and *Alternaria* spp. on desiccation and disappeared with the renewal of water, which may be followed by germination after three to four hours. The same phenomenon has been observed in the ascospores of *Sordaria*.

Sappa (F.). **Nuove specie di Aspergillus dei terreni forestali somali.** [New species of *Aspergillus* from the forest soils of Somalia.]—*Allionia*, 2, 1, pp. 79–95, 1 pl., 3 figs., 1954. [English summary. Received June, 1956.]

Samples taken from tropical soils in the gallery forests of the Giuba river, Somalia [see next abstract], during 1953, yielded three new species of *Aspergillus*, of which two, *A. eburneo-cremeus* and *A. aeneus* almost certainly belong to the *A. nidulans* group while the third, *A. multicolor*, resembles both this group and that of *A. versicolor*. All three species have a crusty appearance owing to unusually copious production of chlamydocytes (Hülle cells).

Sappa (F.) & Mosca (Anna M.). **Ricerche sulla micoflora dei terreni della savanna spinosa somala.** [Studies on the mycoflora of the soil of the Somalian thorny savannah.]—*Allionia*, 2, 1, pp. 195–238, 1 pl., 3 figs., 1 diag., 3 graphs, 1 map, 1954. [English summary. Received June, 1956.]

A study of the fungus flora of the Somalian thorny savannah represented by 90 soil samples taken at depths of 5 to 20 cm. yielded 68 species which are described, including the new species *Hormiscium nodulosum*, *Diplococcium avellaneum*, *Rhizoctonia coniothecioides*, and *R. fuliginea*. The taxonomic groups present were similar to those already found in the Giuba gallery forests [see preceding abstract] but there were fewer species of the Mucorales, more of the Dematiaceae, and the proportion of *Aspergillus* spp. to *Penicillium* was increased.

Steyn (W. J. A.) & Eve (D. J.). **The zinc status of Citrus and Pineapples in the Eastern Cape.**—*S. Afr. J. Sci.*, 52, 11, pp. 270–271, 1956.

A preliminary report is given of an extensive survey of the zinc status of soils

and crops in the eastern Cape regions of South Africa, where the principal crops are citrus [*R.A.M.*, 32, p. 429] and pineapples [cf. 22, p. 143]. Leaf samples of both revealed that deficiency was more widespread than is generally believed, all citrus samples being deficient save where the trees were sprayed with zinc. Most soils on analysis also revealed deficiency, particularly in the sandy soils used for pineapples, though in certain highly alkaline citrus soils and doleritic pineapple soils there was adequate total zinc. Adequate uptake was achieved by lowering the pH of certain citrus soils. Thus in an orchard in the Kat River area where trees had received 1·1 lb. of nitrogen in the form of ammonium sulphate since 1946 the pH was 6·6 and the zinc content of the leaves double that on non-treated soil with the same zinc content (pH 8·3).

When copper and zinc were applied together to either crop, whether in foliar sprays or in soil fertilizer mixture, the presence of the copper limited the uptake of zinc to a level below that observed in untreated plants. Whereas spraying citrus with zinc alone raised the level to well above that of 30 p.p.m., the normal for healthy trees, spraying with zinc and copper aggravated zinc deficiency. This applied also to pineapples, where the optimum level in the leaves is considered to be 44 p.p.m.

Abe (M.), Yamano (T.), Kozu (Y.), & Kusumoto (M.). **Researches on ergot fungus. Part 25. Production of alkaloids by ergot fungus parasitic on Elymus mollis Trin. (Elymus-type ergot fungus).**—*J. agric. chem. Soc. Japan*, 29, 5, pp. 364–369, 2 figs., 2 graphs, 1955. [Japanese, with English summary.]

In further studies at the Institute for Fermentation, Osaka, Japan [cf. *R.A.M.*, 34, p. 237], *Claviceps litralis* isolated from *Elymus mollis* and surface-cultured on liquid media produced a number of alkaloids including a new one for which the name elymoclavine is proposed. The new alkaloid was also obtained from sclerotia of *C. litralis*.

Baudin (P.). **Les maladies des plantes à parfum tropicales.** [The diseases of tropical perfume plants.]—*Rev. Mycol., Paris*, 20, *Suppl. colon.* 2, pp. 73–112, 1955.

Details (mostly taken from the literature) are given on the symptoms, causes, and control of the principal diseases of the tropical plants used in the manufacture of perfumes, with special reference to those grown in Madagascar or suitable for cultivation there. The hosts, each with its own bibliography and arranged in families, are clove [*R.A.M.*, 18, p. 548: 35, p. 42], eucalyptus [27, p. 80], *Melaleuca leucadendra*, *M. viridiflora*, cinnamon, camphor, *Pelargonium capitatum* [loc. cit.], *Cymbopogon citratus*, *C. nardus*, sandalwood, *Ocimum basilicum*, *Pogostemon patchouli*, greater and lesser cardamom, and *Canangium odoratum*. The following have been noted in Madagascar. Infection of *Pelargonium capitatum* by anthracnose (*Glomerella vanillae* var. *pelargonii*) [27, p. 80] is favoured by hot, humid conditions, but disappears during the cool, rainy season. Plantings in flat, clay soils are most susceptible. At the end of the dry season of 1951 *P. capitatum* plants near Antsirabé were attacked by a *Verticillium* wilt (probably *V. albo-atrum*) [cf. 31, p. 385]; the leaves dried up, after about ten days spots appeared on the stalks, and in three weeks death ensued, most of the withered leaves remaining attached to the plants; the roots were affected by a black, wet rot. A wilt apparently due to *Bacterium* [*Pseudomonas*] *solanacearum* was noted in a very damp locality near the forest of Imerimandroso in 1935.

Cultures of *O. basilicum* on the plateau of Itasy are seriously attacked by an *Aecidium*.

Fischer. **Peronospora des Hopfens und Krautfäule der Kartoffeln.** [*Peronospora* of Hops and Potato blight.]—*Hopfen-Rundsch.*, 6, p. 214, 1955. [Abs. in *Z. PflKrankh.*, 63, 4, pp. 228–229, 1956.]

The author estimates that the repeated spraying of hop fields covering an area of 5,167 ha. in the Hallertau region of Germany against *Peronospora* [*Pseudoperonospora humuli*: *R.A.M.*, 30, p. 193] uses 580 tons of highly concentrated copper compounds [per annum]. The overdosages commonly applied would enable an area of 14,000 ha. of potatoes to be treated two or three times against blight [*Phytophthora infestans*]. In the interests of economy the observance of the prescribed concentrations and spraying dates is urged.

Pires (J. A.). **Major diseases of Sugar Cane in British Guiana.**—*Sug. Bull., Georgetown*, 23, pp. 71–75, 1955.

Investigation of sugar-cane leaf scald [*Xanthomonas albilineans*] in British Guiana [*R.A.M.*, 34, p. 817; 35, p. 634] was confined to rating varieties in cultivation and under trial for resistance to the disease, and the results are tabulated. The original categories [33, p. 319] have been amended by the merging of the A (acute) in the VS (very susceptible) group and accepting Spence's addition of an intermediate, S-T (susceptible-tolerant), between S and T. There were 65 seedlings and canes in the R (resistant) class. In an inoculation plantation trial at Skeldon there was a significant tonnage reduction in B. 34104, but not in B. 41227.

Confirmation of the suspected presence of ratoon stunting disease is still lacking. Chlorotic streak is regarded as the most prevalent disease in the colony and an assessment of its possible effect on yield is to be made.

Enoch (M.). **La lutte contre la maladie de Fidji à Madagascar.** [The control of Fiji disease in Madagascar.]—*Rev. agric. Réunion*, N.S., 55, pp. 160–168, 1955.

The author, who paid a visit to Madagascar from 21st to 23rd March, 1955, to study the situation as regards Fiji disease of sugar-cane [*R.A.M.*, 34, p. 107; 35, p. 235], briefly summarizes the steps taken to limit spread along the east coast and prevent the disease from appearing in the industrial plantations on the west coast. All sugar-cane plants near the airports serving Réunion and the interior of Madagascar are being extirpated, and precautions have also been taken to prevent spread by sea, rail, and road communications. Round the affected areas a 'cordon sanitaire' has been made 100 km. long by 25 to 40 km. deep in which the cane is being dug up. In the Tamatave-Brickaville area large-scale measures have been taken to remove infected canes and apply insecticidal treatments against the vectors.

It is recommended that after the 1955–6 season steps should be taken to forbid harvesting from fields with more than a certain percentage of infection, planting non-resistant varieties, making new plantings except on the advice of the Crop Protection service, and using cuttings from infected areas. All varieties growing at the experimental stations should be tested for resistance and others should be introduced from regions where the disease has been brought under control. All canes growing in non-industrial areas should be replaced by healthy cuttings supplied by the Crop Protection services. Only those varieties found to be resistant in Madagascar should be used for large-scale planting in Réunion.

Subba Rao (M. S.), Negi (N. S.), & Khanna (K. L.). **Use of organo-mercurial fungicide as sett treatment for Sugarcane.**—*Curr. Sci.*, 25, 5, pp. 159–160, 1956.

At the Central Sugarcane Research Station, Pusa, India, dipping sugar-cane setts in aretan as a stimulant to germination gave very promising results [cf. *R.A.M.*, 27, p. 386]. The aretan was used at 1, 2, and 4 oz. per 10 gals. water, the treatment

periods being an instant dip, or soaking for 15, 30, 45, or 60 minutes. The best result, germination increased by 36·1 per cent., was given by an instant dip in the 4 oz. solution, the next being 34·3 per cent. from 15 minutes at the same concentration, compared with 14·8 for the control (no treatment).

King (N. C.). **Ratoon stunting disease in Natal.**—*S. Afr. Sug. J.*, 40, 2, pp. 107, 109, 111, 113, 115, 117, 119, 5 figs., 1956.

A tabulated survey is given of field trials at the Chaka's Kraal Experimental Farm, Natal, the results of which clearly demonstrated the serious effects of ratoon stunting virus disease of sugar-cane [*R.A.M.*, 33, p. 382 and next abstract] on the outstanding N:Co. 310 variety, a loss of 20 per cent. in yield being a conservative estimate [cf. 35, p. 328]. Other varieties also sustained heavy damage, and it is thought that the majority of the new releases will soon be deteriorating unless immediate steps are taken to control the disease by the installation of hot-water treating tanks, preferably at the mills.

Ratoon stunting disease. Statement by Experiment Station Committee.—*S. Afr. Sug. J.*, 40, 5, p. 347, 1956.

In connexion with the recent discovery that ratoon stunting virus has been detected in all the commercial sugar-cane varieties grown in South Africa [see preceding abstract], a statement is published by the Sugar Association Experiment Station Executive Committee to clarify the position as far as possible in the light of present knowledge. The practicability of large-scale heat treatment of setts for two hours at 50° C. [cf. next abstract] is examined, taking as an example a grower with 700 acres under cultivation whose annual crop will be approximately 10,000 tons of cane.

Steib (R. J.) & Chilton (J. P.). **Recent studies conducted on the ratoon stunting disease of Sugarcane in Louisiana.**—*Sug. Bull., N. Orleans*, 34, 16, pp. 238–243, 1956.

A tabulated survey is given of tests covering the past three years at the Louisiana Agricultural Experiment Station on the control of ratoon stunting virus of sugarcane, the results of which confirmed previous observations [*R.A.M.*, 35, p. 235] as to the efficiency of the hot-air treatment at 54° C. for eight hours (air set so that the temperature is at 54° for at least the last two hours of the run).

Katsuki (S.). **Parasitic fungus flora of Yaku island, Kyushu. I.**—*J. Jap. Bot.*, 30, 9, pp. 282–288, 1955.

Species of economic interest listed by the author in this flora of parasitic fungi of Yaku island, Japan, include *Plasmopora viticola* on *Vitis ficifolia* var. *thunbergii* [*V.* ? *thunbergii*], *Pseudoperonospora cubensis* and *Sphaerotheca fuliginea* on cucumber, *Erysiphe cichoracearum* and *Corticium centrifugum* on tomato, *Elsinoe fawcetti* on citrus, *Mycosphaerella berkeleyii* [*R.A.M.*, 17, p. 651] on groundnut, *M. persicae* on peach, *M. colocasiae* on *Colocasia antiquorum* var. *esculenta*, and *Entyloma oryzae* on rice [33, p. 280].

Talbot (P. H. B.). **New and interesting records of South African fungi. Part II.**—*Bothalia* 6, 3, pp. 489–500, 15 figs., 1956.

In this further contribution [*R.A.M.*, 31, p. 460] the author records 16 species of fungi, all new records for South Africa, three of which (helicosporous Fungi Imperfecti) are new species. Included are *Piricularia oryzae* on rice in the Nylstroom district [C.M.I. map No. 51], *P. setariae* on *Setaria italica*, *P. grisea* on *Digitaria sanguinalis*, and *Cordyceps tuberculata* from a dead moth.

Di Fonzo (M. A.). **Las enfermedades de las plantas en la provincia del Chaco (Argentina).** [Plant diseases in Chaco province (Argentina).]—*Rev. argent. Agron.*, 23, 1, pp. 29–35, 1956.

The author presents a briefly annotated list of 81 diseases and disorders of 27 plant families in the Chaco province of Argentina [*R.A.M.*, 25, p. 234]. The most serious include *Piricularia oryzae* on rice (in the north only) [C.M.I. map No. 51], *Cercospora beticola* on garden beet [No. 96], and *Colletotrichum gloeosporioides* [*Glomerella cingulata*] on mango [cf. *R.A.M.*, 20, p. 27] and papaw.

Cummins (G. B.). **Descriptions of tropical rusts.—VIII.**—*Bull. Torrey bot. Cl.*, 83, 3, pp. 221–233, 17 figs., 1956.

This is an annotated list of 23 new rust fungi [*R.A.M.*, 31, p. 402], 15 of which are from Africa, six from the Americas, and two from the Pacific area. They include *Phakopsora oplismeni* on *Oplismenus compositus* in New Guinea and on *O. undulatifolius* in Luzon [Philippines], and *Puccinia cissi* on *Cissus* sp. in Kenya, the hosts being ornamentals.

Hiratsuka (N.). **Uredinological studies.**—382 pp., 10 pl., 1955. [Japanese. Author's summary.]

This book comprises 19 chapters, most of which are based chiefly on the author's studies in Japan [*R.A.M.*, 35, p. 125, *et passim*] during the past 30 years. Chapters I to V include a historical review and descriptions of the morphology and life-history of the Uredinales. Chapters VI to X are concerned with the taxonomy, host relations, heteroecism, phylogeny, and geographical distribution of the group. Chapters XI to XV deal with specialization, dissemination, environmental relations and vitality, infection, and pathological morphology and physiology of the hosts. Species parasitic on economic plants, the economic importance of the Uredinales, and hyperparasitism are described in chapters XVI and XVII. Chapter XVIII (pp. 248–339) is a complete list of the species occurring in the Japanese Archipelago and Formosa, Southern Saghalien, and the Kuriles. The plates consist of 50 photomicrographs and photographs of symptoms. A list of titles referring to Japanese rusts, indexes of fungi, hosts, and authors, and a glossary are appended.

Dale (W. T.). **A preliminary list of Jamaican Uredinales.**—*Mycol. Pap. Commonw. Mycol. Inst.* 60, 21 pp., 1 fig., 1955.

This publication incorporates all the known records of rusts in Jamaica, totalling 102 species. Newly published records include *Angiospora zeae* on maize, *Cerotelium fici* on fig, *Puccinia cynodontis* on *Cynodon dactylon*, *Uromyces hawei* on *Asclepias curassavica*, and *U. vignae* on cowpea. The rust on cotton is designated *Phakopsora gossypii* (Arth.) n.comb. (syn. *P. desmium*).

Langdon (R. F. N.). **The genus Cerebella.**—*Mycol. Pap. Commonw. Mycol. Inst.* 61, 18 pp., 2 pl., 6 figs., 1955.

Writing from the Department of Botany, University of Queensland, the author reviews the literature on the genus *Cerebella*, records his own observations, and lists the many specimens examined. He concludes that all the 20 hitherto named species belong, in fact, to one, viz., *C. andropogonis*, giving full synonymy and an emended diagnosis of the genus and the species.

Jenkins (Anna E.) & Bitancourt (A. A.). **Notas sôbre as antracnoses maculadas e assuntos correlatos. VIII. Espécimens escolhidos de Elsinoe e Sphaceloma.** [Notes on the spot anthracnoses and cognate subjects. VIII. Specimens col-

lected of *Elsinoe* and *Sphaceloma*.]—*Biológico*. 21. 12. pp. 217–221. 8 figs., 1955. [English summary.]

Eight of the 13 specimens of *Elsinoe* and *Sphaceloma* comprised in this further annotated list [cf. *R.A.M.*, 35. pp. 490. 691. and next abstract] are recorded for the first time from the areas named: *E. canavaliae* on *Canavalia ensiformis* and *E. cinnamomi* on camphor in Formosa: *E. cinchonae* on *Cinchona macrocalyx* compl. (new host) in Ecuador; *E. mulleri* on *Polyscias guilfoylei* in Hawaii; *E. puertoricensis* on *Randia formosa* (new host) in Cuba; *E. theae* on tea [C.M.I. map No. 154] in Mozambique; *S. rosarum* on rose in Mexico; and *S. symphoricarpi* on *Symphoricarpus albus* var. *laevigatus* in New Hampshire, United States.

E. piri was determined for the first time [*R.A.M.*, 11. p. 723] on an interception of pear stems from Portugal made at Santos, Brazil, in 1932. It was also observed on the same substratum by Da Camara and Da Luz at Sacavém, Portugal, in 1939 [19. p. 365] and assigned to a new species, *Micropeltis piri*.

Records hitherto unpublished include *E. batatas* on sweet potato [23. p. 1], *Sphaceloma araliae* on *Aralia chinensis* (believed to be a new host) and *Fatsia japonica*, and *S. tsugii* on *Paulownia tomentosa*, all in Japan, and *S. viticola* on *Vitis shifunensis* in Formosa.

The specimens on which was based the report of *S. symphoricarpi* on *Symphoricarpus albus* var. *laevigatus* in France and Denmark (abs. in *Phytopathology*, 38. p. 2, 1948) are also cited.

Bitancourt (A. A.) & Jenkins (Anna E.). **Estudos sôbre as Miriangiales. V. Elsinoaceas da Costa do Marfim (Africa Ocidental Francesa).** [Studies on the Myriangiales. V. Elsinoaceae of the Ivory Coast (French West Africa).]—*Arq. Inst. biol., S. Paulo*, 22. pp. 67–77. 2 pl., 1955. [French summary.]

The nine species of *Elsinoe* [cf. preceding abstract] in this critically annotated list from the Ivory Coast include, besides five new ones, *E. mangiferae* causing mango scab [*R.A.M.*, 26. p. 552], the first record outside the western hemisphere; and *E. mulleri*, hitherto limited to Venezuela and Brazil, which is responsible for spot anthracnose of the hedge shrub *Polyscias guilfoylei*.

Kern (H.). **Physiologische Untersuchungen an Ascomyceten aus der Gattung Leucostoma.** [Physiological investigations on Ascomycetes of the genus *Leucostoma*.]—Reprinted from *Verh. schweiz. naturf. Ges., 1955*. pp. 143–144, 1955.

The author refers to his studies of a number of strains of *Leucostoma* species in pure culture and outlines his views on the taxonomy of the genus, which have already been noticed from another source [*R.A.M.*, 34. p. 820].

Yamamoto (W.). **Taxonomic studies on the Capnodiaceae. II. On the species of the Eucapnodieae.**—*Ann. phytopath. Soc. Japan*. 19. 1–2. pp. 1–5. 30 figs., 1954. [Japanese, with English summary.]

The writer describes six more sooty mould fungi collected in Formosa [*R.A.M.*, 35, p. 127], three of which are new species.

Ezuka (A.). **Artificial culture of two species of Exobasidium: E. vexans Massee and E. japonicum Shirai.** *Bull. Tea Div. Tôkai-Kinki agric. Exp. Sta.* 3. pp. 28–53. 14 figs., 1955. [Japanese, with English summary. Received April, 1956.]

The writer succeeded in culturing *Exobasidium japonicum* from *Rhododendron obtusum* var. *kaempferi* and also *E. vexans* from the tea variety C-5, very susceptible to blister blight [*R.A.M.*, 31. p. 258]. Both were grown on potato and Czapek's

agar by transferring basidiospores or secondary spores, those of *E. japonicum* budding to form yeast-like colonies. The basidiospores of *E. vexans* either germinated by normal germ-tubes, forming chlamydospore-like bodies at each apex, or more generally by abnormally thick germ-tubes, which gave rise to secondary spores or were occasionally directly transformed into chlamydospore-like bodies.

Gondo (M.). **Effect of plant hormones on Tobacco mosaic symptoms. II.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 39–40, 1954. [Japanese, with English summary.]

In a further contribution to this series [*R.A.M.*, 35, p. 47] the writer noted an inhibitory effect against tobacco mosaic virus infection produced in leaves of *Nicotiana glutinosa* up to 96 hours after spraying them with α-naphthalene acetic acid (1 in 20,000). The catalase activity of treated leaves was higher than in untreated.

Gondo (M.). **Respiration of virus diseased Tobacco plant (II).**—*Bull. Fac. Agric. Kagoshima Univ.*, 3, pp. 25–27, 1954. [Japanese, with English summary. Received 1955.]

In further studies in this series [*R.A.M.*, 32, p. 647] it was found that the respiration index of tobacco leaves infected with cucumber mosaic virus on plants grown in water culture and the decrease in respiration with leaf growth were always greater than in healthy ones.

Miyamoto (Y.) & Kawamura (F.). **Effects of X-ray radiation upon the pathogenicity and antigenicity of Tobacco mosaic virus.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 53–57, 2 graphs, 1954. [Japanese, with English summary.]

Preparations of tobacco mosaic virus rendered non-infective by X-ray irradiation [cf. *R.A.M.*, 35, pp. 584, 638] were serologically active and were increasingly so in proportion to the decrease in infectivity. The authors suggest that the inactivation of virus by ionizing radiation is due to a single ionization or a single cluster of ionization. Inactivation doses were estimated to be 28×10^4 r. for 0·2 per cent. preparations and 2×10^4 r. for 0·02 per cent.

Yoshii (H.), Tominaga (Y.), & Morioka (T.). **On the inactivating effect of some higher plant juices against Tobacco mosaic virus.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 25–28, 1954. [Japanese, with English summary.]

At the Laboratory of Plant Pathology, Kyushu University, the sap of the following plants, containing a large amount of tannins, was found to be strongly inhibitory to infection by tobacco mosaic virus [cf. *R.A.M.*, 35, p. 331] as tested on half leaves of *Nicotiana glutinosa*: *Acer insulare*, *Aesculus turbinata*, *Aralia elata*, *Camellia japonica*, *Distylium racemosum*, *Geranium nepalense*, *Lagerstroemia indica*, pomegranate (*Punica granatum*), *Robinia pseudoacacia*, *Sambucus sieboldiana*, and tea.

Ginoza (W.) & Atkinson (D. E.). **Comparison of some physical and chemical properties of eight strains of Tobacco mosaic virus.**—*Virology*, 1, 3, pp. 253–260, 3 graphs, 1955.

In further work at the University of California, Los Angeles, on eight strains of tobacco mosaic virus [*R.A.M.*, 34, p. 110] their isoelectric points, ultra-violet absorption spectra, and electrophoretic mobilities between pH 4·15 and 8 were investigated. The results confirmed earlier classification into four groups [loc. cit.]. In certain cases differences in ultra-violet spectra and in the slope of the mobility versus pH curves can be correlated with differences in the tyrosine, tryptophane,

and histidine contents, but the underlying reasons for similarity in groupings based on different physical properties are still unknown.

FRANKLIN (ROSALIND E.). **Location of the ribonucleic acid in the Tobacco mosaic virus particle.**—*Nature, Lond.*, 177, 4516, pp. 928–930, 1 graph, 1956.

Studies at the Birkbeck College Crystallography Laboratory, University of London, demonstrated that the ribonucleic acid in tobacco mosaic virus [*R.A.M.*, 35, p. 638] is deeply embedded in the virus protein and therefore its molecular structure and chain direction must be closely related to the structural arrangement of the protein.

CASPAR (D. L. D.). **Radial density distribution in the Tobacco mosaic virus particle.**—*Nature, Lond.*, 177, 4516, p. 928, 1 graph, 1956.

Studies at Yale University, New Haven, Connecticut, and the California Institute of Technology, Pasadena, on the structure of tobacco mosaic virus [see preceding abstract] based on the differences in X-ray scattering from orientated gels of normal and lead-substituted virus revealed that the tobacco mosaic virus particle is hollow, a hole of about 19 Å. in radius extending along its axis; the effective radius of the virus in solution is about 84 Å.; and there is a region of high density at a radius of 24 Å. and another of higher density at 40 Å. Peaks of smaller density at about 67 Å. and 79 Å. are also significant.

MARCELLI (E.). **Osservazioni su di una nuova virosi del Tabacco trasmissibile per seme.** [Observations on a new virus disease of Tobacco transmissible through seed.]—*Tabacco, Roma*, 59, 676–677, pp. 404–409, 2 figs., 1955. [English summary.]

In 1954 six Virginia Bright tobacco plants growing near one another in a planting of about 5,000 at Salerno, Italy, developed symptoms of yellow ring spot virus [a strain of tobacco ring spot virus: cf. *R.A.M.*, 18, p. 763; 32, p. 593; 35, p. 638], not previously recorded in Europe. The disease was readily transmitted experimentally to healthy Samsun tobacco seedlings, the leaves of which had been rubbed with carborundum. The seed from affected plants was small and of only 8 to 34 per cent. germinability, as against 76 to 94 per cent. for seed from healthy plants. Of the seedlings grown from the small seeds 0·9 to 7·1 per cent. were chlorotic, as against only 1·1 per cent. from normal seed. When sap from 146 chlorotic seedlings was inoculated into healthy tobacco plants the disease was transmitted to 16 (10·9 per cent.), though when sap from 300 seedlings of normal colour was used, only one plant became infected.

The evidence obtained indicates that the disease is seed-transmitted to a slight extent and that the chlorosis of the seedlings, though a non-specific symptom, may indicate the presence of the virus.

KÖHLER (E.). **Über die Ausbreitung von Mosaikviren in der Tabakpflanze. I. Das Verhalten der Kartofelviren X and Y.** [On the distribution of mosaic viruses in the Tobacco plant. I. The behaviour of the Potato viruses X and Y.]—*Phytopath. Z.*, 26, 2, pp. 147–160, 1 fig., 1956.

The object of the studies herein reported [from the Institute for Agricultural Virus Research, Brunswick, Germany], was to clarify the problem of the unequal movement of potato viruses X [*R.A.M.*, 35, p. 551] and Y [35, p. 333] in inoculated tobacco plants, the former proceeding so much more slowly than the latter that it may never reach the growing leaf tip in plants over 40 cm. in height. The experiments were performed on pedunculate Samsun Bashi Bagli Turkish tobacco plants with strains M 23 and Bs of virus X and Go 16 of Y. Besides the ordinary method

of inoculation by rubbing the infective material over the whole leaf surface, the following procedure was employed. A cardboard ring, 25 mm. outer and 13 mm. inner diameter, with its under side smeared with vaseline was laid on a leaf with the median on a main lateral vein. The outer circle was outlined with Indian ink, the inner circle carborundum inoculated and the ring removed. The tissue within the marked circle was excised after a pre-determined number of days. The initial advantage of virus Y could not be counteracted by defoliation of the plants or by the admixture of virus X. Moreover, the divergent rates of progression cannot be explained by differences in transport mechanism. A more plausible hypothesis is the operation in the phloem—equally indispensable to both viruses for distant movement—of inhibitory elements directed specifically against virus X and probably inactivating some or all of its component particles [cf. 27, p. 263]. The virus might also conceivably be localized in the phloem, e.g., by fixation to cell substances.

In the vicinity of a main leaf vein virus X traverses a distance of 6 mm. at an estimated speed of 0·08 to 0·12 mm. in three to five days, a rate not less than that of Y. In the petiole the latter begins to advance more rapidly, while in the stem the average rate of Y in these tests (on plants of moderate age) was computed at 0·6 to 0·7 cm. per hour as compared with only 0·2 to 0·3 cm. for virus X.

Wenzl (H.). **Die Sklerotien-Stengelfäule und andere Krankheiten des Tabaks.** [Sclerotium stem rot and other Tobacco diseases.]—*Pflanzenarzt*, 9, 6, pp. 57–59, 5 figs., 1956.

The author describes the symptoms of *Sclerotinia sclerotiorum* [*R.A.M.*, 30, p. 84] infection on tobacco in a small outbreak in a damp sheltered situation at Wels, in Austria, and recommends phytosanitary control measures, and avoidance of humid planting sites. He also notes the occurrence elsewhere in Austria of symptoms probably to be ascribed to potassium deficiency.

Holdeman (Q. L.). **The effect of the Tobacco stunt nematode on the incidence of Fusarium wilt in flue-cured Tobacco.**—*Phytopathology*, 46, 2, p. 129, 1956.

At the Pee Dee Experiment Station, Florence, South Carolina, the incidence of infection by *Fusarium oxysporum* var. *nicotianae* in the susceptible Oxford 1–181 tobacco variety was increased by joint inoculation with the fungus and the tobacco stunt nematode, *Tylenchorhynchus claytoni*, as compared with the former alone [cf. *R.A.M.*, 34, p. 453]. It is thought that the presence or absence of the nematode in the soil may be one of the factors involved in the erratic development of the pathogen in the field.

Wenzl (H.). **Die Stolbur-Virose in Österreich.** [Stolbur virus disease in Austria.] —*PflSchBer.*, 16, 10–12, pp. 159–162, 2 figs., 1956.

The author reports an experiment in which healthy tomato stocks developed symptoms of stolbur [tomato big bud virus: see following abstracts] after scions with 'stolbur' symptoms had been grafted onto them, confirming the virus nature of the disease.

Wenzl (H.). **Die Stolbur-Viruskrankheit in Österreich.** [Stolbur virus disease in Austria.]—*Pflanzenarzt*, 9, 1, pp. 4–7, 5 figs., 1956.

The author briefly describes and discusses the importance of the diseases of tomato, tobacco, potato, and paprika [chilli] caused by the stolbur [tomato big bud] virus in Austria [see preceding abstract]. The most important economic losses resulting from this virus are those caused by wilt and spindle sprout in potato [*R.A.M.*, 35, p. 540].

Big bud (rosette) of Tomatoes and other plants.—*Agric. Gaz., N.S.W.* 67, 3, pp. 132–135, 147, 11 figs., 1956.

This is a short note on the symptoms of big bud disease in tomato [*R.A.M.*, 35, p. 48] and the distribution of the disease in New South Wales. A number of other hosts are listed, and symptoms on tomato, aster, wild gooseberry [*Nicandra physalodes*], thorn apple [*Datura* sp.], phlox, and cat's ear (*Hypochaeris radicata*) are illustrated.

Kern (H.) & Klueppel (D.). **Die Bildung von Fusarinsäure durch Fusarium lycopersici** *in vivo*. [The production of fusarinic acid by *Fusarium lycopersici in vivo*.]—*Experientia*, 12, 5, pp. 181–182, 1956. [English summary.]

By means of radio-active isotope dilution methods it was demonstrated at the Federal Technical Institute, Zürich, Switzerland, that *Fusarium* [*bulbigenum* var.] *lycopersici* [see following abstracts] metabolizes the wilt toxin fusarinic acid (or a closely related substance) [*R.A.M.*, 35, p. 555] not only in pure culture but also during its parasitic phase of existence in Tuckswood tomato plants.

Waggoner (P. E.) & Dimond (A. E.). **Altering disease resistance with ionizing radiation.**—*Phytopathology*, 46, 2, pp. 125–127, 4 graphs, 1956.

In further studies at the Connecticut Agricultural Experiment Station, the irradiation of five- to six-week-old Bonny Best tomato seedlings five or ten days before inoculation with *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici* [*R.A.M.*, 32, p. 517; 35, p. 50] increased resistance to wilt, which was reduced, on the other hand, by the same treatment at the time of inoculation. Localized irradiation of the roots five days before inoculation enhanced resistance significantly, whereas irradiation carried out simultaneously with inoculation resulted in only a slight increase. An insignificant decline in resistance followed shoot irradiation at any time.

Del Prado (F. A.). **Ziekten van de Tomaat in Suriname.** [Diseases of the Tomato in Surinam.]—*Surinaam. Landb.*, 4, 2, pp. 52–66, 11 figs., 1956. [English summary.]

Tomatoes are grown only on a small scale for local consumption in Surinam, where the period of cultivation (on shell ridges in the coastal plain) is restricted to the minor dry and minor rainy seasons. Information on the diseases of the crop is presented in semi-popular terms. Potentially destructive are the wilts caused by *Sclerotium rolfsii*, *Fusarium oxysporum* f. [*F. bulbigenum* var.] *lycopersici*, and *Pseudomonas solanacearum*, collar rot (*Alternaria solani*) [C.M.I. map No. 89], and damping-off due to various [unspecified] micro-organisms. The only serious foliar disease is early blight, also caused by *A. solani*, *Cladosporium fulvum* [No. 77] and *Septoria lycopersici* being of minor importance.

Fruit rots are associated with *A. solani*, *Sclerotium rolfsii*, *Bacillus* [*Erwinia*] *aroideae*, *Rhizopus* spp., and *Fusarium* spp.

Physiological disorders include blossom-end rot and sunscald. Symptoms suggestive of a virosis and also of a nutrient (probably phosphorus) deficiency were observed but not further investigated.

Strömme (E.). **Kjemisk desinfektion av jord til Tomater.** [Chemical disinfection of soil for Tomatoes.]—*Nord. JordbrForskn.*, 36, 1–4, pp. 289–291, 1954.

Experiments were undertaken in Norway from 1949 to 1951 to determine the efficacy of various chemicals as substitutes for the costly and tedious process of steaming against cork [brown root] rot of tomato [? *Cylindrocarpon radicicola*: *R.A.M.*, 35, p. 554 and next abstract]. Chloropicrin at a dosage of 3 ml. per 6 l. soil and DD soil fumigant at 5 ml. gave the most promising results. As the former is

relatively expensive (Kr.2 per sq. m. as compared with Kr.3 for steaming) it might be worth while to try an alternating schedule of the cheaper DD and steam sterilization.

Fich (C.). **Danske erfaringer med hensyn til jorddesinfektion.** [Danish experiences in respect of soil disinfection.]—*Nord. JordbrForskn.*, 36, 1–4, pp. 292–297, 1954.

Information is presented on soil disinfection in Danish glasshouses, primarily against tomato nematodes and diseases, of which 'brown roots' [(?) *Cylindrocarpon radicicola*: see preceding abstract] is regarded as an important cause of soil exhaustion. Chloropicrin has given generally satisfactory results in its control, though not equal to those secured by steam sterilization, the disease having been observed to recur extensively at the end of the growing season. Inferior to steaming or chloropicrin, but adequate for a less radical treatment, are formalin and brassicol.

Watson (D. J.). **Botany department.**—*Rep. Rothamst. exp. Sta., 1954*, pp. 64–72, 1955.

In a solution-culture experiment carried out at Rothamsted by E. B. Kidson to investigate the cause of blotchy ripening or 'cloud' of tomatoes [cf. *R.A.M.*, 29, p. 199; 33, p. 645; 35, p. 493], high-manganese plants developed a leaf chlorosis typical of manganese excess, but the fruits remained free from 'cloud'. At an early stage in the experiment vascular necrosis was present in fruits from plants provided with a high iron supply, but the symptoms were not characteristic of 'cloud' and did not occur in fruits that developed subsequently. Typical 'cloud' symptoms appeared later, when the plants were transferred to a more dilute culture solution. The experiments are to be continued in New Zealand.

Orsenigo (M.). **Contributi alla conoscenza del genere Endothia. Caratteri colturali di alcune colture di 'Endothia'.** [Contributions to the knowledge of the genus *Endothia*. The cultural characters of some isolates of *Endothia*.]—Reprinted from *Ann. Fac. Agr.*, Ser. 1 (*Pubbl. Univ. S. Cuore*. N.S., 51), pp. 34–65, [? 1955. French and English summaries.]

Continuing his studies on the differentiation of species of *Endothia* [*R.A.M.*, 31, p. 406; 32, p. 523], the author compared the cultural characters on rice, white maize meal, white maize meal agar, and potato dextrose agar of 26 isolates of *Endothia* obtained from various sources. It was possible to separate *E. parasitica* and *E. fluens* [loc. cit.] on this basis and temperature relations. Only two isolates had cultural characters like those described for *E. parasitica* by Shear, Stevens, and Tiller (*Bull. U.S. Dep. Agric.* 380, p. 82, 1917). Seven other isolates, somewhat resembling *E. parasitica*, were more or less distinctly different from it and must be regarded as not belonging to this species. Two isolates had characters of *E. fluens*, as described by Shear *et al.* [op. cit.], but seven, while resembling it, were yet different. The cultural characters of *E. viridistroma* were distinct from those of the other isolates.

The isolates are regarded as being forms intermediate between *E. parasitica* and *E. fluens*, at least in their cultural characters. If conformity with the standards of the species given by Shear and Stevens (*Circ. U.S. Dep. Agric., Bur. Pl. Indus.* 131, p. 17, 1913) and Shear *et al.* [see above] is to be maintained, it would be necessary to make six new species resembling *E. parasitica* and five additional to *E. fluens*. However, in view of the intermediate nature of the forms, three groups, purely for convenience, are suggested, *luteolostroma* for most of the *E. parasitica* isolates, *xanthostroma* for *E. fluens* and most of the *Endothiella gyrosa* isolates, and *viridistroma* for *Endothia viridostroma*.

Orsenigo (M.). **Esame spettrofotometrico di estratti alcoolici di colture di Endothia.** [A spectrophotometric examination of alcoholic extracts of isolates of *Endothia*.]—Reprinted from *Ann. Fac. Agr.*, Ser. 2 (*Pubbl. Univ. S. Cuore*, N.S., 52), pp. 120–135, 5 graphs, [? 1956. French and English summaries.]

A study by means of the Beckman spectrophotometer of the alcoholic extracts of the 26 isolates of *Endothia* previously examined [see preceding abstract] and of one other showed that the absorption curves obtained could be grouped (on a basis of their absorption maxima) into series closely agreeing with those established on a basis of the cultural characters [loc. cit.] of the strains.

Cole (H.) & Fergus (C. L.). **Factors associated with germination of Oak wilt fungus spores in wounds.**—*Phytopathology*, 46, 3, pp. 159–163, 4 graphs, 1956.

In further studies on oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*] at the Pennsylvania Agricultural Experiment Station [*R.A.M.*, 35, p. 54 and following abstracts], the ascospores and conidia of colonies on malt extract agar plates and other nutrient media withstood 83 days' freezing at —10° C. They were most resistant to high temperatures (within a range from 24° to 50°) in the dry state, the ascospores generally surviving longer than the conidia. The thermal death point of conidia was 40° to 42° and of ascospores 42° to 44°. The mucilaginous ascal matrix was not dissolved by the sap of red or white oaks or by any of several enzymes or solvents tested except 5 per cent. dreft and amyl acetate, both of which were toxic to the ascospores.

A free film of liquid was indispensable for the germination of either kind of spore. In red or white oak sap the spores germinated up to 90 per cent. Ascospores germinated on moist exposed sapwood of 48-hour-old wounds [cf. 27, p. 165] and conidia on those of 36 hours old on branch sections maintained at 100 per cent. relative humidity at 25°. In distilled water the percentages tended to be lower than in the presence of nutrients. Both conidia and ascospores germinated most profusely at a pH range of 4 to 8, with a minimum at 3. Ethanol (exceeding 5 per cent. by volume) inhibited growth and germination of both spore types. The influence of citric, oxalic, succinic, kojic, malic, pyruvic, and tartaric acids (metabolic end-products of micro-organisms) depended, in general, on their ability to lower the pH. Kojic acid, however, permitted germination but inhibited subsequent growth at favourable pH levels. It is apparent that the period during which wounds remain suitable for infection may be limited by duration of sap flow and the influence of other micro-organisms present.

Curl (E. A.). **Removal of spores from mycelial mats and transmission of Endoconidiophora fagacearum by air currents.**—*Plant Dis. Reptr*, 39, 12, pp. 977–982, 1955.

In laboratory experiments at the Section of Applied Botany and Plant Pathology, Illinois State Natural History Survey, Urbana, conidia of the oak wilt fungus *Endoconidiophora fagacearum* [*Chalara quercina*: see preceding and next abstracts] were not readily removed from artificially and naturally grown mycelial mats by applied air currents. More were detached from air-dried mats by air applied at a high velocity than from air-dried or moist mats by low velocity air and more hyphal fragments and conidium-bearing conidiophores were removed than free conidia. A few ascospores were removed from one naturally grown mat by air of high velocity. In the field conidia were trapped on agar plates placed within a few inches of mycelial mats on wilted oak trees. Five of the 96 wounded oaks subjected to air blown across naturally grown mats wilted and died.

McMullen (L. H.). **Insects and their relation to Oak wilt in Wisconsin.**—*Diss. Abstr.*, 15, 12, p. 2378, 1955. [Received June, 1956.]

This information concerning the long-distance transmission of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*] in Wisconsin has already been noticed from another source [*R.A.M.*, 34, p. 757].

Alben (A. O.). **Preliminary results of treating rosetted Pecan trees with chelated zinc.**—*Proc. Amer. Soc. hort. Sci.*, 66, pp. 28–30, 1955.

Effective control of pecan rosette (zinc deficiency) [*R.A.M.*, 34, p. 759] on Ruston and Norfolk sandy loams near Tyler, Smith County, Texas, was obtained with chelated zinc (14 per cent. metallic zinc), applied at ½, 1, and 2 lb. per tree as a water solution sprinkled under the branch spread. The top six inches of the soils ranged in pH value from 5·4 to 6·4. Four Schley trees were treated at each rate of application on 8th March, 1953; on 27th May, 1954, all, except two of those given the ½ lb. dosage, were free from rosette. Adjacent untreated trees rosetted in 1953 remained affected throughout 1954. Previous experiments in the same orchard had indicated that 20 to 30 lb. of zinc sulphate (25 per cent. zinc) per tree was required to correct the deficiency, one to three years being necessary for a complete cure.

Vaartaja (O.) & Wilner (J.). **Field tests with fungicides to control damping-off of Scots Pine.**—*Canad. J. agric. Sci.*, 36, 1, pp. 14–18, 1956.

In trials at the Forest Nursery Station, Indian Head, Saskatchewan, from 1951 to 1954 inconsistent control of damping-off of Scots pine (*Pinus sylvestris*) was obtained with formaldehyde, acetic acid, and sulphuric acid as soil treatments and also with a combined soil and seed treatment with kolodust (sulphur and dichlone) [*R.A.M.*, 34, p. 164]. Pelleting the seed (100 parts) with 2·5 per cent. methyl cellulose (10) and zineb, captan, or thiram (all 20) was effective [cf. 35, p. 407], but not with nabam and vancide 51, which were, in addition, phytotoxic. Combining seed pelleting with repeated soil applications of thiram resulted in good control early in the season but there was subsequently considerable seedling mortality.

Jacks (H.). **Seed disinfection. XII. Glasshouse tests for control of damping-off of Pinus radiata seed.**—*N.Z. J. Sci. Tech.*, Sect. A, 37, 5, pp. 427–431, 1956.

Further studies in this series [cf. *R.A.M.*, 35, p. 178] at the Plant Diseases Division, Auckland, New Zealand, were concerned with the protective value of a number of seed disinfectants against damping-off of pine (*Pinus radiata*) seed following soil inoculation with *Pythium ultimum* [34, p. 688] and *Pellicularia filamentosa* [*Corticium solani*: 35, p. 133 and next abstract].

In a phytotoxicity test in [uninoculated] steamed soil betanal (2·8 per cent. mercury as methoxyethyl mercury silicate) was phytotoxic, and agrosan at 17 per cent. and phygon XL at all strengths (30 to 2 per cent.) depressed emergence. None of the treatments increased emergence over the controls, but no damping-off occurred. Treatments in unsteamed soil had no effect on emergence, but reduced post-emergence damping-off, though not inhibiting it. In inoculated soil ceresan, orthocide 75 (75 per cent. captan), and spergon reduced the number of diseased seedlings; and increased emergence in *Pythium*-inoculated soil whereas with *C. solani* the treatments gave no increase in emergence.

Gibson (I. A. S.). **An anomalous effect of soil treatment with ethylmercury phosphate on the incidence of damping-off in Pine seedlings.**—*Phytopathology*, 46, 3, pp. 181–182, 1956.

In seven tests at the Forest Department, Nairobi, Kenya Colony, the application of granosan to seed-beds as a 0·3 per cent. aqueous suspension at sowing time at

a rate of 1 gal. (imperial) per 2 sq. yds. resulted in a heavier loss of pine (*Pinus patula* and *P. radiata*) seedlings from damping-off (*Rhizoctonia* [*Corticium*] *solani* and *Pythium ultimum*) [*R.A.M.*, 34, p. 761 and preceding abstract] than occurred in untreated beds: in two the increases were statistically significant. No adverse effects followed the use of the fungicide at 1·2 per cent. It is concluded on the basis of further experiments that granosan indirectly assists the spread of the pathogens through the soil by its selective action on the antagonistic microflora, competition with which is thereby reduced.

Copeland (O. L.) & McAlpine (R. G.). **The interrelations of littleleaf, site index, soil, and ground cover in Piedmont Shortleaf Pine stands.**—*Ecology*, 36, 4, pp. 635–640, 1 map, 1955. [Received July, 1956.]

During 1949–50 a survey was made in 18 Piedmont counties of South Carolina and Georgia of areas with mainly second-growth, even-aged, shortleaf pine [*Pinus echinata*: *R.A.M.*, 35, p. 56], where the mean percentage of trees with little leaf was 12·6. The disease was particularly severe in Abbeville, Fairfield, and Cherokee counties in South Carolina and Elbert county, Georgia. An average of 25 per cent. of the soil samples taken yielded *Phytophthora cinnamomi*, mostly in moist, heavy-textured soils. Certain well-drained soils consistently supported stands of high site index and relatively low little leaf. Disease incidence was markedly correlated with soil internal drainage and erosion. Incidence was severe and the site index and surface soil nitrogen generally low where the ground cover consisted chiefly of broom sedge [*Andropogon virginicus*] or grasses. The fertility of most forested Piedmont soils is generally low.

Dengler (A.). **Schütteversuch mit finnischen und märkischen Kiefern.** [Needle-fall experiment on Finnish and Mark Pines.]—*Arch. Forstw.*, 4, 1, pp. 4–8, 1955.

The results of inoculation experiments carried out simultaneously in Finland and Germany with *Lophodermium pinastri* on Finnish and German pines [*R.A.M.*, 35, p. 502] clearly demonstrated the greater resistance of the former in both countries.

Holtzmann (O. V.). **Organisms causing damping-off of coniferous seedlings and their control.**—*Diss. Abstr.*, 15, 12, p. 2392, 1955. [Received June, 1956.]

Numerous isolations from *Pinus ponderosa*, *Picea abies*, and other conifers in a nursery at Pullman, Washington, indicated that *Fusarium oxysporum* is the most prevalent pathogen during post-emergence damping-off [*R.A.M.*, 33, p. 512], but *Pythium debaryanum* was more important at the pre-emergence stage. Incidence was greatest at three weeks after 30 per cent. emergence. *F. oxysporum*, *F. roseum*, and *P. debaryanum* were isolated from many damped-off seedlings of *Thuja occidentalis* and *T. orientalis*.

Thiram controlled damping-off caused by *Rhizoctonia* sp. and *P. debaryanum*. Seed treatment with NP–1083, methyl endomethylene-dieldrin seed treater, hexachlorobenzene M–518 JT 866, panogen, orthocide RE 2875 45–15 seed treater, puraseed, and chloranil gave promising results and warrants further testing. Panogen showed promise as a soil drench.

Jørgensen (E.). **Trametesangreb i laehegn.** [*Trametes* infection in shelter belts.] —*Dansk. Skovforen. Tidsskr.*, 40, 6, pp. 279–285, 1 fig., 1955. [English summary.]

From the results of recent investigations on quickset hedges, e.g., of hawthorn, *Sorbus intermedia*, and Sitka spruce, at the Research Stations of Hornum, Studsgaard, and Lundgaard, it is believed that many of the gaps in the shelter belts

of west and north Jutland, Denmark, are due to infection by *Fomes annosus* [*R.A.M.*, 35, p. 565 and next abstract], coming from decayed fence posts.

Nissen (T. V.). **Actinomycetes antagonistic to Polyporus annosus Fr.**—*Experientia*, 12, 6, pp. 229–230, 1956. [German summary.]

Nearly half the [unspecified] number of actinomycetes isolated from forest soils in Denmark proved to be antagonistic to *Polyporus* [*Fomes*] *annosus* [see preceding abstract] *in vitro*, and one strain of *Streptomyces* sp. also suppressed the mycelial growth of the pathogen in sterilized garden soil.

Although the mode of infection of *F. annosus* has not been definitely established, it is generally believed that the mycelium invades the dead tap-root of spruce from the soil and thence enters the living roots and stem. On the basis of these experiments at the Royal Veterinary and Agricultural College and the Royal Technical University, Copenhagen, the possibility is envisaged of combating the root rot by stimulation of the actinomycetes through the application of green manures to the soil.

Van der Westhuizen (G. C. A.). **Three species of Curvularia from Pinus.**—*Bothalia*, 6, 3, pp. 501–505, 1 plate, 3 figs., 1956.

Descriptions are given of *Curvularia brachyspora* and *C. maculans*, both collected on shoots of *P. patula* infected by *Diplodia pinea* [*R.A.M.*, 33, p. 657], the former in Transvaal and the latter in Rhenosterhoek, Orange Free State, and of *C. pallescens*, isolated from blue-stained sapwood of the same host at Sabie, Transvaal; the last-named produced a bluish grey stain when inoculated on to blocks of sterilized sapwood.

Moriondo (F.). **Formazione di ecidi interni da parte di Melampsora pinitorqua Rostr.** [The formation of internal aecidia by *Melampsora pinitorqua* Rostr.]—[*Ann. Acad. ital. Sci. for.*], 2, pp. 265–271, 3 figs., 1954.

The writer describes the formation of internal aecidia of *Melampsora pinitorqua* [*R.A.M.*, 34, p. 758 and next abstract] in young shoots of *Pinus pinea* in Italy. This occurs after the host has been completely invaded by the fungus and the outer tissues have been killed. It may be regarded as a final stage of the parasite in the host which then becomes totally destroyed.

Moriondo (F.). **Osservazioni sul ciclo biologico della Melampsora sp. del Pioppo in Italia.** [Observations on the life-cycle of the *Melampsora* sp. affecting Poplar in Italy.]—*Ital. for. mont.*, 9, 5, pp. 3–8, 4 figs., 1954.

Early in April, 1954, the author found uredospores of *Melampsora pinitorqua* [see preceding abstract] on some of the newly opened shoots of poplar (*Populus canescens*) growing in the forest of Feniglia, Grosseto, Italy, among pines [*Pinus* spp.] infected by the rust the previous year. Many of the affected shoots withered; others survived, but became contorted. As a rule the uredosori on poplars at Feniglia occur later in the year and are found only on the leaves, infection attaining maximum intensity early in autumn. In the present instance, however, the pines round these poplars were not infected and bore no aecidia, though teleutospores were germinating on the leaves of the first-year branches of the poplars.

Although the attack was very severe on individual shoots, only a few were infected. The pustules were mostly along the axis of the shoot and on the leaf stalks; very few were found on the leaves, on which they appeared in a less advanced stage of development, but uredosori, usually reported to develop only on the lower surface were open on both surfaces of the leaves. The sori appeared to have started at the base of the shoot, where infection was invariably most intense; the apex frequently appeared to be healthy, while the leaves on which the first small

pustules had been seen near the point of insertion of the stalk were completely infected.

One-year-old branches bearing infected bud shoots contained mycelium which, presumably, had overwintered in the tissues. As a rule *M. pinitorqua* over-winters in the uredospore state. In the present instance, however, the mycelium had penetrated so deeply that it had become 'systemic', existing almost in a state of symbiosis with the host tissues

From the morphological characters of the uredospores the fungus would appear to fall into the *M. tremulae* group

Experimental inoculations with basidiospores from teleutospores on fallen poplar leaves kept in a damp chamber gave characteristic symptoms on the young pine shoots in one week. Inoculations in spring of bud shoots of *P. tremula* with aecidiospores from the experimentally infected pine shoots caused the production of uredosori in about ten days.

The evidence obtained demonstrates that this rust does not require both its hosts for perennation, but can survive on poplar only. The ability to do this probably depends on environmental conditions, but if it is so poplar will be liable to infection whenever environmental conditions are suitable. Pine would then be an occasional host of the rust. Pines in Italy, especially young plantings, may now be expected to become subject to unexpected and severe attacks of the rust wherever *Populus alba*, *P. tremula*, or *P. canescens* trees are present in the vicinity.

Lightle (P. C.). **Longevity of Peridermium harknessii aeciospores stored at 40° F.** *Plant Dis. Reptr*, 39, 12, pp. 983–984, 1955.

At the California Forest and Range Experiment Station aecidiospores of *Cronartium coleosporioides*, the causal agent of western gall rust of *Pinus ponderosa* [*R.A.M.*, 35, p. 250], remained viable after over a year's storage under favourable conditions (40° F.).

Campana (R. J.) & Schneider (I. R.). **Fungicide tests for control of Cedar Apple rust on Hawthorn.**—*Plant Dis. Reptr*, 39, 12, pp. 985–988, 1 fig., 1955.

In experiments on the control of cedar rust (*Gymnosporangium juniperi-virginianae*) on hawthorn (*Crataegus* spp.) [*R.A.M.*, 35, p. 499] in Illinois a water suspension of teleutospores and basidiospores prepared from the nearest source of galls was applied to the trees with a hand pack Hudson sprayer, following five applications of fungicide with the same sprayer. This method of inoculation proved highly successful on rough-leaved species; smooth-leaved hawthorns resisted infection, a distinction already noted in work with *G. globosum* [14, p. 368]. All the fungicides reduced the average number of lesions per leaf on rough-leaved trees from 15·04 for the untreated to 1·73 or less, tag 331 ($\frac{1}{2}$ pint per 100 gals. water), calcium sulphamate plus B–1956 ($\frac{3}{4}$ lb.), emmi ($\frac{1}{2}$ pint), vancide 51 plus vancide sticker (2 qt.), and phygon (1 lb.) being significantly better than the control at the 1 per cent. level and monsanto 4367 at the 5 per cent. The first three gave better control than a fermate-sulphur ($\frac{1}{2}$–$2\frac{1}{2}$ lb.) combination. Calcium sulphamate and monsanto 4367 caused chlorosis, severe marginal burning, withering and death of leaves and are unsuitable at the dosages tested. Tag 331 and emmi, which caused relatively slight injury, appear promising for the control of the disease.

Sasaki (T.). **Contributions to the Japanese fungous flora III.**—*Bull. Tokyo Univ. For.* 47, pp. 145–153, 1 pl., 4 figs., 1954.

In this further contribution [cf. *R.A.M.*, 31, p. 353] six wood-rotting basidiomycetes occurring in Japan are described and illustrated. New to Japan is *Cytidia salicina*, causing a white rot of *Salix* and rarely *Populus*. Species attacking conifers include *Stereum sanguinolentum* causing a red heart rot, *Fomitopsis sensitiva*

(white pocket rot), and *Bondarzewia montana* [*Polyporus montanus*] (white rot). On frondose trees white pocket rots were caused by *S. pendulum* and *S. vibrans*.

Banerjee (S.) & Sinha (A. K.). **Sporulation and spore-discharge in Polystictus sanguineus (L.) Mey.**—*Sci. & Cult.*, 21, 10, pp. 618–620, 1956.

At the Department of Botany, Calcutta University, the authors studied spore discharge in detached pieces of sporophores of *Polystictus sanguineus* [*R.A.M.*, 34, p. 687] from *Shorea robusta*, following the method previously used [cf. 34, p. 267]. The sporophores appear in nature from July to October, though they may be induced up to January provided the infected logs are regularly wetted. A fresh fruit body may shed spores for up to 37 hours under varying conditions of light, temperature (27° to 31° C.), and humidity (70 to 80 per cent.). In 28 out of 36 tests discharge began when the moisture content of the sporophore was in the range 330 to 370 per cent. (in terms of dry weight) and ceased in the range 230 to 280 per cent. The relative humidity of the air controlled spore discharge indirectly by determining the rate at which the pieces dried out.

Harris (G. R.) & Wayman (M.). **The sulphite pulping of woods of the northern B.C. coastal region.**—*Pulp Pap.* (*Mag.*) *Can.*, 57, 3, pp. 221–223, 1956.

In a comparative investigation at the Research Laboratory, Columbia Cellulose Company, Prince Rupert, British Columbia, samples of *Tsuga heterophylla* infected by *Polyporus circinatus* and by a dark-stain rot of undetermined origin produced a pulp markedly inferior to that derived from sound wood of the same species, Sitka spruce, and *Abies amabilis*. The infected material was characterized by higher permanganate numbers, lower brightness values, higher silica, ash, and soda-soluble contents, and much lower alpha-cellulose; moreover, the cooking liquors from the rotted samples tended to be considerably darker.

Freyschuss (S. K. L.). **A comparative investigation of some fungicidal substances upon fungi occurring in wet pulp.**—*Svensk PappTidn.*, 58, 22, pp. 815–817, 1955. [Swedish and German summaries.]

At the Swedish Forest Products Research Laboratory, Stockholm, the following compounds in actual use or for prospective use in the pulp and paper industry were compared for their fungistatic and fungicidal action on cultures in malt extract solution of a number of fungi commonly found in wet pulp [cf. *R.A.M.*, 34, p. 417 *et passim*]: 8-hydroxyquinoline dissolved in ethanol, 8-hydroxyquinoline plus monoethanolamine, 8-hydroxyquinoline acid potassium sulphate, phenylmercuric acetate [35, p. 409], sodium pentachlorophenate, and 3,5-dimethyltetrahydro-1,3,5,2H-thiadiazine-2-thione. The most active were phenylmercuric acetate and 8-hydroxyquinoline in ethanol, a ten times higher concentration being necessary to secure comparable effects with sodium pentachlorophenate and 3,5-dimethyltetrahydro-1,3,5,2H-thiadiazine-2-thione.

Rennerfelt (E.) & Nyberg (J.). **Nachimprägnierung von Schwellen.** [Reimpregnation of sleepers *in situ*.]—[German translation from original in] *Järnv.-Tekn.*, 1, 12 pp., 25 figs., 2 graphs, 1955.

The authors describe a method developed in Sweden for the protective reimpregnation of pine railway sleepers *in situ* with wolmanite, a mixture of sodium bichromate (25 per cent.) and sodium fluoride (75 per cent.) [cf. *R.A.M.*, 34, p. 558].

Only those sleepers which are judged to be still sufficiently sound are treated, and each receives a total of 400 gm. of the mixture, half being in the form of a paste painted on the wood alongside the rails and half in the form of 'cartridges' inserted

into borings, two of which are made at each side of the rail. Techniques and apparatus for testing the soundness of the sleepers and making the borings are described.

Theile (K.). **Moderne Verfahren zur Konservierung von Holz und Holzbauten.** [Modern methods for the preservation of wood and wooden structures.]—*Seifen-Öle*, 82, 1, pp. 15–20, 9 figs., 1956. [English, French, and Spanish summaries.]

Useful information on up-to-date methods of timber preservation is presented and supplemented by a table giving the chemical designations, particulars of appearance, insecticidal and fungicidal threshold values, class of poison, requisite concentrations, mode of application, and other features, e.g., leachability, of (A) water-soluble and (B) oil-soluble chemicals. The former category comprises five groups, viz., zinc compounds (excluding zinc silicofluoride); N-salts (alkalifluorides with or without the addition of dinitrophenol); U-salts, including alkalifluorides and alkalibichromate with or without dinitrophenol; UA-salts (alkalifluoride, -arsenate, and -bichromate with or without dinitrophenol); and SF-salts (silicofluorides); also copper sulphate, sodium dinitrophenol, sodium DNC, and sodium pentachlorophenol. To the last category belong tar oil and chloronaphthalene preparations, besides pentachlorophenol and organic copper and mercury compounds.

Buro (A.). **Untersuchungen über die Veränderung der Pilzresistenz von Hölzern durch Hitzebehandlungen in Metallschmelzen.** [Studies on the alteration of the fungal resistance of timbers by heat treatment in molten metal.]—*Holzforschung*, 9, 6, pp. 177–181, 4 figs., 1955.

At the Material Testing Institute, Berlin, samples of pine and beech wood heated in a bath of molten metal, consisting of 50 per cent. tin, 32 per cent. lead, and 18 per cent. cadmium, acquired more resistance to rotting by *Coniophora cerebella* [*C. puteana*] and *Lentinus lepideus* [*R.A.M.*, 35, pp. 254, 566] than those heated in air or nitrogen [34, p. 559]. *Polystictus versicolor* was somewhat less sensitive to the metals. The enhanced resistance was shown to be due not only to changes in the wood incidental to heating, but also in a high degree to the toxicity of the alloy. The addition of shavings of the alloy to malt agar cultures of the three fungi retarded or prevented their growth. Cadmium was the most toxic, lead acted only on *L. lepideus*, and tin did not appear to inhibit development at all.

De la Rocha G. (G.). **El cultivo de la Alcachofa, las Vainitas, y el Ajo.** [The cultivation of Artichoke, String Bean, and Garlic.]—*Circ. Estac. exp. agríc. La Molina* 69, 24 pp., 15 figs., 1955. [English summary. Mimeographed.]

This publication deals with all aspects of the cultivation of the above-mentioned crops in Peru. Of the three, only string beans [*Phaseolus vulgaris*] are affected to any great extent by fungi, the chief of which are *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 28, p. 66], *Erysiphe polygoni* [cf. 21, p. 360], *Uromyces appendiculatus* [23, p. 316], *Colletotrichum lindemuthianum* [C.M.I. map No. 177], and *Sclerotinia sclerotiorum* [*R.A.M.*, 32, p. 147].

Garlic is affected by [unspecified] fungus diseases which may be prevented or controlled by improved drainage and by spraying with dithane and perenox.

Broadbent (L.). **Brassica virus diseases.**—*Agriculture, Lond.*, 63, 2, pp. 69–72, 1956.

Much of the information in this general account of the three most important viruses of *Brassica* crops in Great Britain, cauliflower mosaic [*R.A.M.*, 35, p. 585],

turnip yellow mosaic [33. p. 396], and cabbage black ring spot [34. p. 68], has already been noticed in this *Review*. As aphids may acquire and transmit these viruses within a few minutes, spraying cannot offer full control but is of great value in preventing the build up of infection [34. p. 703], though many growers are reluctant to invest in such protection.

Attention should be focussed on keeping the seedbeds healthy, which, if possible should be sited away from sources of infection, otherwise barrier crops must be used [35. p. 585]. Seeding should be as thick as is compatible with healthy growth, since the greater the number of seedlings the smaller the percentage attacked. The largest ones are more likely to be infected and should be discarded.

Among cauliflowers the varieties Majestic, Satisfaction, and Late Feltham are very susceptible to cauliflower mosaic virus, but All-the-year-round, Continuity, and St. George are tolerant.

CROSSAN (D. F.). **Cercosporella leafspot of crucifers.**—*Tech. Bull. N.C. agric. Exp. Sta.* 109, p. 23, 6 figs., 4 graphs, 1954.

The author gives a general description of white spot disease of crucifers (*Cercosporella brassicae*) [*R.A.M.*, 28. p. 263], together with a review of the literature. The disease is frequently associated with anthracnose (*Colletotrichum higginsianum*) and with *Alternaria* leaf spot (*Alternaria oleracea* [*A. brassicicola*]). In North Carolina the disease leads to serious losses of turnips and other crucifers grown for greens. A number of wild and cultivated crucifers are susceptible.

The conidiophores of *Cercosporella brassicae* are produced from tuberculate, often coalescent, stromata beneath the epidermis. The fungus can persist in soil and leaf litter for at least nine months, and it may be that the stromata are resistant structures. Preliminary tests with *Brassica oleracea* var. *acephala* suggest that the disease may be seed-borne.

Until resistant varieties are produced control must be based on (1) ploughing and disking of leaf litter, with rotation of crops, (2) destruction of wild crucifers at the margin of fields, and (3) the use of disease-free seed.

The disease is favoured by low temperatures (55° to 65° F.), high humidity, and splashing rain. The optimum conditions for growth in culture were a temperature range of 20° to 24° C. and a pH of 5·5 to 7.

YUKAWA (Y.). **Histo-chemical studies on plant gall tissues. II. Microchemical observations on gall of Turnip club-root and contiguous tissue. III. Ingredients of Tomato stem gall caused by Bacterium tumefaciens Smith & Townsend.**—*Bull. Fac. Agric. Yamaguti Univ.* 5, pp. 1–8, 4 figs.; pp. 9–16, 3 figs., 1954. [Japanese, with English summary. Received March, 1956.]

In turnip tissue infected by *Plasmodiophora brassicae* [cf. *R.A.M.*, 26. p. 518] there was more ferric iron than in adjoining healthy tissue, but in general both gave a similar analysis and did not differ in pH values (5·3 to 6). Two phenol bases and an indole substance were found in infected cells, the protein reactions of which were more marked than for other tissues. Paper chromatography showed less aspartic and glutamic acids in the galls than in healthy tissue, suggesting that these acids may be assimilated by the pathogen.

In a similar study of crown gall (*Bacterium* [*Agrobacterium*] *tumefaciens*) [35. pp. 513, 514] in tomato stems ammonium and phosphate salts and reducing sugars were found in the galls, but starch, which occurs in normal stem tissue, was absent. Some compounds with two phenol bases occur in the galls, and also proteins, absent in normal stems. Oxidase, peroxidase, and glutathione are more active in the galls than elsewhere, but the pH of both normal and gall tissues is about 5·8. The reduction activity of the gall tissue is greater, and the oxidation-reduction potential is rH 14 in tumour strand cells as compared to rH 16 elsewhere.

BUDZIER (H. H.). **Über die Beeinflussung des Auftretens der Kohlhernie-Krankheit durch Kompostgaben.** [On the influence of compost doses on the occurrence of Cabbage club root disease.]—*Z. PflKrankh.*, 63. 5. pp. 257–259. 1956. [English summary.]

In pot experiments under field conditions at the Institute for Phytopathology and Plant Protection, University of Rostock, Germany, the incidence of club root (*Plasmodiophora brassicae*) in Maleksberger Yellow mustard was reduced from 100 to 66 per cent. by mixing into naturally infected soil 50 per cent. compost (pH 6·8 to 7), comprising six kinds of vegetable refuse, four of which were prepared by the Indore method. Used in proportions of 25 and 12 per cent. the composts reduced the disease to only 91 and 97 per cent., respectively.

FRANDSEN (N. O.). **Untersuchungen über Cercospora beticola. V. Konidienproduktion.** [Studies on *Cercospora beticola*. V. Conidial production.]—*Zucker*, 9. 3. pp. 51–53, 1956.

In further studies in the current series [*R.A.M.*, 35. p. 338 and next abstract] the optimum temperature for conidial production by *Cercospora beticola* in spots on sugar beet leaves was found to be in the region of 25° C. Constant temperatures of 30° and upwards caused a heavy decline in abundance. The actual numbers of conidia on each of three severely infected plants were estimated to lie between 200,000,000 and 500,000,000. Discussing the mode of conidial spread on the basis of his own observations in Germany and the findings of other workers, the author concludes that wind-blown rain and mist drops are the principal agents of dissemination, wind alone being relatively unimportant.

FRANDSEN (N. O.). **Über den Wirtskreis und die systematische Verwandtschaft von Cercospora beticola.** [On the host range and systematic affinity of *Cercospora beticola*.]—*Arch. Mikrobiol.*, 22. 2, pp. 145–174, 18 figs., 1955.

Some of the information in this exhaustive study of *Cercospora beticola* on sugar beet at the Max Planck Institute for Breeding Research, Voldagsen and Rosenhof, Germany, has already been noticed from another source [see preceding abstract]. All the Chenopodiaceae inoculated with monospore cultures on potato dextrose or oatmeal agar, i.e., *Atriplex hortensis*, *Chenopodium ambrosioides*, *C. capitatum*, *C. foetidum*, *C. foliosum*, *C. quinoa*, and spinach were uniformly susceptible both in the greenhouse and in the field. Also susceptible in both series of tests were *Urtica urens* and *Plantago major*, while *Rumex acetosa*, *R. patientia*, *U. dioica*, and *Arctium minus* were attacked in the greenhouse but not out-of-doors.

Cercospora dubia developed spontaneously on *Chenopodium album* and *Atriplex hortensis* and was also pathogenic to them in inoculation experiments, as it was to *C. ambrosioides* and *C. foliosum*, but not to beet, which also withstood infection by *Cercospora mercurialis* from *Mercurialis annua* [35. p. 312].

In a comprehensive discussion on the taxonomy of the fungus the available evidence is considered to point to the identity of *C. anthelminthica* and *C. chenopodiicola* with *C. beticola*. It is clear, however, from experimental results and field observations that Johnson and Valleau's proposal to identify *C. apii* and *C. nicotianae* with *C. beticola* [29. p. 175] cannot be accepted. *C. chenopodii* is regarded as a synonym of *C. dubia*. The natural choice of hosts, say at family level, is considered to be an important taxonomic criterion for specific determination within the genus.

The systematic position of a number of genera identical with or closely related to *Cercospora* is examined. Among them *Centrospora* [25. p. 343] is held to comprise species of *Cercospora* characterized by premature conidial germination. In conclusion, existing methods for the classification of *Mycosphaerella* [29. p. 122 *et passim*] are criticized. In the author's opinion there should be a division into several

genera based primarily on the related conidial state, as originally proposed by Klebahn (cited by Wolf & Wolf [27, p. 288]).

Ramularia beticola [cf. 35, pp. 62, 501] is stated to be of infrequent occurrence in south Germany and was represented only once in the collections used for this investigation. Since the symptoms caused by the pathogen closely resemble those of *C. beticola*, a brief description of its morphology is given, based on leaf material from Cork, Republic of Ireland [32, p. 54].

The conidiophores were less nodulose than those of *C. beticola*, and were a pale smoky colour, changing gradually at the base to brown. The hyaline conidiophores and branched conidial chains gave the mycelial mats at infected points a pure white appearance, contrasting with the yellowish- or greyish-white of *C. beticola*. The spores varied in shape from oval to elongated oval or cylindrical.

Noll (A.). **Untersuchung über Infektionsmethoden zur Züchtung von Beta-Rüben auf Resistenz gegen Cercospora beticola.** [A study of inoculation methods for the breeding of *Beta* Beets for resistance to *Cercospora beticola*.] —*Zucker*, 9, 10, pp. 228–233, 1956.

Of various methods of infecting sugar and fodder beets with *Cercospora beticola* tested in the field, seed-bed, and greenhouse at the Biological Institute, Brunswick, Germany, from 1949 to 1954, the strewing of dried, ground, diseased leaves over the plants and inoculation with spore suspensions or mycelial emulsions from pure cultures proved equally effective; a temporary covering over the plants was essential in both cases. Treatment of the seed with leaf dust or mycelium also gave good results. Some of the isolates from different parts of Germany were much less virulent than others.

Brune (H.). **Veränderungen des Nährstoff- und Mineralstoffgehaltes von frischem Zuckerrübenblatt nach Befall mit Cercospora beticola.** [Changes in the nutrient and mineral contents of fresh Sugar Beet leaf after infection with *Cercospora beticola*.]—*Zucker*, 9, 11, pp. 262–266, 1956.

The results of comparative analyses at the Institute for Animal Physiology and Nutrition of the University of Göttingen, Germany, of samples of healthy sugar beet leaves and others infected by *Cercospora beticola*, harvested in November, 1955, are fully described and tabulated.

The organic substance of diseased foliage decreased with a rising incidence of infection. The crude protein contents of samples at the same stage of growth were roughly equal, irrespective of the intensity of leaf spot. The raw fibre content of leaves retarded in their development by the disease was low. The pure protein and α-amino-nitrogen contents of infected leaves were lower than in healthy ones. Despite the increase in the 'amide content' of diseased foliage, the solubility of the crude protein in pepsin hydrochloride was greatly diminished; there was a large increase in oxalic acid, calcium, magnesium, and potassium with a corresponding fall in phosphorus and sodium. It could not be reliably established, however, that diseased leaves and roots were sufficiently different from healthy in composition to be deleterious to the health of stock when used as fodder.

Coons (G. H.), Owen (F. V.), & Stewart (D.). **Improvement of the Sugar Beet in the United States.**—*Advanc. Agron.*, 7, pp. 89–139, 9 figs., 1955.

This general account of sugar beet improvement, covering its history in Europe and in the United States, is accompanied by a list of 144 references. The section on breeding for disease resistance (pp. 100–117) deals with curly top virus, leafspot (*Cercospora beticola*), downy mildew (*Peronospora schachtii*), rust (*Uromyces betae*), black root (*Aphanomyces cochlioides*), and yellows virus; most of the information given has been noticed in this *Review* from time to time.

Ui (T.) & Tochinai (Y.). **The relation between the occurrence of root-rot of Sugar Beets and the vicissitude of population of the causal fungus, Pellicularia filamentosa, in the soil.**—*Ann. phytopath. Soc. Japan*, 19, 3–4, pp. 109–113, 3 figs., 1955. [Japanese, with English summary.]

Root rot of sugar beet caused by *Pellicularia filamentosa* [*Corticium solani*] is prevalent from the end of July in parts of Hokkaido, where damping-off of beet seedlings is caused by the same pathogen in May. The incidence of these diseases is directly correlated with the amount of the fungus found in the soil.

Maramorosch (K.). **Mechanical transmission of curly top virus to its insect vector by needle inoculation.**—*Virology*, 1, 3, pp. 286–300, 1 fig., 1955.

At the Rockefeller Institute for Medical Research, New York, the author devised a means of mechanically transmitting sugar beet curly top virus [*R.A.M.*, 35, p. 339 *et passim*] to its leafhopper vector, *Circulifer tenellus* [*Eutettix tenella*], by needle inoculation. A method of microinjection was employed, partially described in this paper and to be more fully described elsewhere. It is hoped that this technique will enable further light to be thrown on the relationship of this virus to its vector. Mechanically inoculated insects could transmit the virus only after an incubation period, which varied from one to nine days with a 1 in 30 dilution of the virus-containing fluid and from five to 20 days with 1 in 300.

Steudel (W.) & Heiling (A.). **Versuchsergebnisse zur Höhe der vermeidbaren Vergilbungsschäden an Zuckerrüben im Rheinland und in Westfalen in den Jahren 1953 und 1954.** [Results of experiments on the level of avoidable loss from yellows damage in Sugar Beet in Rhineland and Westphalia in the years 1953 and 1954.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 1, pp. 1–6, 2 graphs, 3 maps, 1956.

Statistical analyses of sugar beet yields in a number of districts in Rhineland and Westphalia, Germany, in 1953 and 1954 were made on untreated plots and plots treated with systox and metasystox to reduce the spread of yellows virus [cf. *R.A.M.*, 35, p. 570 and next abstract]. Losses varied widely and depended on many factors, though principally on the local level of infection, vector activity, and the growing conditions of the crop [34, p. 271], young beet in particular being heavily affected. Experiments since 1951 in a number of areas have confirmed the advisability of early sowing and all measures to promote rapid growth [35, p. 257].

Hijner (J. A.) & Martinez Cordon (F.). **De vergelingsziekte der Bieten. III. Enige onderzoekingen over de vermenigvuldiging van perzikbladluizen op Suikerbietenbladeren.** [The yellows disease of Beets. III. Some investigations on the multiplication of Peach aphids on Sugar Beet leaves.]—*Meded. Inst. Suikerbiet, Bergen-o.-Z.*, 23 (*1953*), 4, pp. 251–270, 5 graphs, 1955. [English and French summaries.]

The results of field observations and greenhouse experiments at Bergen-op-Zoom, Holland, showed that peach aphids (*Myzus persicae*) multiplied more extensively on yellows virus-diseased than on healthy sugar beets [*R.A.M.*, 33, p. 132 and following abstracts]. Chemical analyses revealed a higher content of various sugars and of potassium in infected than in healthy leaves. Spraying the plants with 5 per cent. potassium chloride (once before setting the aphids on the leaves and four times afterwards at two-day intervals) resulted in a heavy increase of multiplication, while a comparable but slighter effect was obtained with 5 per cent. sucrose.

A study of the distribution of the aphids on the plants revealed their preference for the outer leaves of the diseased and the heart of the healthy.

The residual effects of spraying with systox (0·1 per cent.) were more lasting in the greenhouse than in the field, but in no case could the treatment wholly counteract the stimulus afforded to aphid multiplication by the virus-infected leaves.

Van Duuren (A. J.). **De vergelingsziekte der Bieten. IV. Een chemische methode voor de bepaling van de intensiteit van de vergelingsziekte van Suikerbieten. (Voorlopige mededeeling).** [The yellows disease of Beets. IV. A chemical method for the determination of the intensity of the yellows disease of Sugar Beets. (Preliminary communication).]—*Meded. Inst. Suikerbiet, Bergen-o.-Z.*, **25** (*1955*), 3, pp. 51–59, 1956. [English summary.]

A description is given of a new chemical method, based on the use of a reagent consisting of 0·5 per cent. 3–5 dinitro-salicylic acid dissolved in 1 N sodium hydroxide, for measuring the intensity of beet yellows virus infection [see preceding and following abstracts]. Although its value has not yet been definitely established, the procedure seems likely to be of use in determining the relative activity of different isolates in greenhouse tests and in the prediction of losses in the field.

Van Duuren (A. J.). **De vergelingsziekte der Bieten. V. Onderzoek naar de storingen in de stofwisseling van de Suikerbiet, veroorzaakt door de vergelingsziekte.** [The yellows disease of Beets. V. Investigation on the disturbances in the metabolism of the Sugar Beet caused by the yellows disease.]—*Meded. Inst. Suikerbiet, Bergen-o.-Z.*, **25** (*1955*), 3, pp. 61–99, 1956. [English and French summaries.]

The following were the principal changes found in sugar beets at the Institute for Rational Sugar Production, Bergen-op-Zoom, Holland, caused by yellows virus infection [see preceding and next abstracts; cf. *R.A.M.*, **33**, p. 130]: increased sugar (glucose, fructose, and sucrose) in the foliage and decreased leaf and root weight; decrease of organic (especially oxalic) acid content; increase of insoluble polysaccharides (chiefly araban) and reduction of pectin (uronic acid) in the leaves; decrease of total and protein nitrogen, increase of glutamine in the leaves and of total, protein, and glutamine nitrogen in the roots; and decline in phosphatase activity. The most remarkable change was the 20-fold increase in reducing sugars.

It is postulated that decreased phosphatase activity is the primary effect of the disease, followed by a number of secondary modifications. The reducing sugar content of the leaf increases as the synthesis of sucrose is retarded, with a resultant reduction in the amount transported to the roots. The reduction of pectin and the formation of insoluble polysaccharides operate unfavourably on transit through the cell walls. Destruction of the ribonucleic acid content of the plant by the virus is regarded as the probable explanation of the decrease in protein synthesis, which in turn is directly responsible for the increase of glutamine. The destruction of chlorophyll in the leaves may be an effect of protein hydrolysis.

Rapport van de Commissie ter Bevordering der Suikerbietenteelt in de Noordelijke Provinciën over 1954. [Report of the Commission for the Promotion of Sugar Beet Cultivation in the Northern Provinces for 1954.]—*Meded. Inst. Suikerbiet, Bergen-o.-Z.*, **25** (*1955*), 1, pp. 1–48, 4 figs., 1 graph, 1956.

Information on beet yellows virus and its control in northern Holland [see preceding abstracts] during 1954 is presented on pp. 31–40 of this report. The black bean aphid [*Aphis fabae*] was much more prevalent than the green peach aphid [*Myzus persicae*] and was no doubt mainly responsible for the spread of infection. A survey of 67 fields, commencing early in September, revealed an incidence of 10·5 per cent. yellows in an average of 65,000 plants per ha. As in previous years,

density of sowing influenced the development of infection, which amounted to 20·1 per cent. in stands with less than 60,000 plants per ha., 12·1 in those with 60,000 to 65,000, and 6·8 above this. It was demonstrated that the proximity of seed beets or broad beans doubled the percentage of yellows in beet crops.

The success of aphicidal treatments with systox depends on their timely application, i.e., before mass invasion of the fields, which in 1954 took place early in July.

ZIMMER (K.). **Wirtspflanzen der virösen Rübenvergilbung.** [Host plants of Beet yellows virus.]—*NachrBl. dtsch. PflSchDienst (Braunschweig). Stuttgart*, 8, 3, pp. 41–43, 1956.

A list is given, in alphabetical order of families, of the hosts known to date of beet yellows virus [*R.A.M.*, 35, p. 501], followed by a list of the 19 papers from which the information was obtained.

LASSACK (H.). **Die Ausbreitung der Rübenkräuselkrankheit und ihres Vektors, der Rübenblattwanze, Piesma quadrata Fieb. (Heteropt. Piesmid.) in Niedersachsen.** [The spread of Beet crinkle disease and its vector, the Beet leaf bug, *Piesma quadrata* Fieb. (Heteropt. Piesmid.) in Lower Saxony.]—*Z. angew. Ent.*, 38, 1, pp. 67–72, 2 maps, 1955.

This is a detailed survey of the distribution of beet leaf crinkle and its vector, *Piesma quadrata* [*Zosmenus quadratus*], in Lower Saxony, Germany [*R.A.M.*, 35, p. 138], with a discussion of the environmental factors involved in the spread of the disease. In 1953 an area of 42,000 ha. was affected, while in 1954 a further advance was observed in a westerly direction only.

QUANTZ (L.). **Neuere Ergebnisse der Virusforschung bei Gemüsehülsenfrüchten.** [Recent results of virus research in leguminous vegetables.]—*Lehrg. gärtn. Pflanzenz. Samenb.*, Göttingen, 21–24 Juni, pp. 18–24, 1955.

Initially the author discusses bean mosaic virosis and 'black legginess' caused by the same virus on garden beans [*Phaseolus* spp.: *R.A.M.*, 33, p. 461], the latter being an expression of the infection in hypersensitive varieties. In Germany there is no known host on which the virus may overwinter, so that control lies in the production of clean seed.

To judge the level of infection seed samples of the varieties Saxa and Doppelte holländische Prinzess from the harvests of 1950 to 1953 were examined. Twenty per cent. of the samples were infected, at levels ranging from 1 or 2 to occasionally 10 to 30 per cent. The author also investigated the disease in its relation to varieties, the times of sowing and infection, environment, and the health of the seed.

Over three years, seed transmission varied from nil in the variety Imuna to up to 20 per cent. in Kaiser Wilhelm Riesen and Doppelte holländische Prinzess. There is apparently little or no seed transmission in resistant or highly tolerant varieties [33, p. 517]. Early sowing is advisable, as seed infection is at a minimum in plants contracting the virus during or after flowering. When samples of two varieties were grown in many parts of Germany, the importance of avoiding conditions favourable to aphids became evident. Slight infection of seed crops can be overcome by roguing as the first pinnate leaves are emerging.

The paper concludes with brief accounts of bean yellow mosaic virus [loc. cit.], pea mosaic virus [30, p. 300], pea enation mosaic virus [31, pp. 312, 313], and pea leaf roll virus [34, p. 272].

BURKE (D. W.). **Soil microflora relationships in the development of Bean root rot in Columbia basin soils.**—*Diss. Abstr.*, 15, 12, pp. 2390–2391, 1955. [Received June, 1956.]

A survey was made of the relative numbers of micro-organisms in surface and

subsoil samples of virgin and cultivated soils of the Columbia Basin, Washington, and the effect of these soils on inoculum of *Fusarium solani* f. *phaseoli*, the root rot pathogen of beans [*Phaseolus vulgaris*: *R.A.M.*, 34, p. 579]. The use of pure cultures or infested soil as inocula in concentrations sufficient to cause severe root rot in a virgin soil in the greenhouse produced far less damage in a soil in which beans had been grown but were free from root rot. The ability of this soil to suppress the pathogen was destroyed by heat or chemical sterilization. When spores of *F. solani* f. *phaseoli* on water agar were buried in the soil an indication was obtained of the mechanism by which the inoculum potential of the pathogen may be depressed and also the state in which it survives. Soil free from root rot favoured germ-tube growth and mycelial development with comparatively late formation of small, terminal chlamydospores. In naturally infested soil germ-tube growth was suppressed and numerous large chlamydospores were formed within the macrospores and also terminally on the germ-tubes. Both mycelium and germ-tubes then lysed within six days in both soils and only the chlamydospores survived. They germinated in the presence of a bean root. The disease-suppressing property of the healthy soil appeared to be associated directly with cropping and management practices and only indirectly with soil type.

A survey of root rot in 24 bean fields in the Columbia Basin having various cropping and management histories demonstrated that *F. solani* f. *phaseoli* is the principal bean root pathogen present. Fields in which other crops had been grown for several years prior to beans were largely free from root rot. However, it generally developed extensively in new land where beans were one of the first crops planted, and especially where they were grown in consecutive years.

Dye (D. W.). **Field trials on control of halo blight of Beans (Pseudomonas phaseolicola (Burkholder) Dowson).**—*N.Z.J. Sci. Tech.*, Sect. A, 37, 5, pp. 458–461, 1956.

In field trials at the Plant Diseases Division, Auckland, New Zealand, halo blight (*Pseudomonas* [*medicaginis* f.sp.] *phaseolicola*) [*R.A.M.*, 35, p. 82] was effectively controlled on bean plants [*Phaseolus vulgaris*], variety Masterpiece, even when heavily infected after spraying twice or three times with inoculum, by three fortnightly applications (in 1953–4) or five weekly (in 1954–5) of Bordeaux mixture (6–8–100) or streptomycin [33, p. 574] (75 p.p.m.). These respectively reduced the average percentage of infected pods in 1954 from 21·1 (control sprayed with water only) to 2·2 and 12 per cent. and in 1955 from 24·1 to 2·2 and 8·6 per cent. Although giving better control, Bordeaux mixture injured the plants, but streptomycin can be used at higher concentrations without damage. Yields were increased in 1954 (a year favourable for the disease) from 6·7 lb. per plot (control) to 19·4 (Bordeaux mixture) and 17·4 (streptomycin), the corresponding figures for 1955, a year not favourable for the disease, being 24·7, 24·3, and 29·9. Phygon XL at 1 lb. per 100 gals. proved ineffective in the first year and was not used again.

Fujikawa (T.). **Studies on the necrotic mosaic of Broad Beans.**—*Agric. & Hort.*, 30, pp. 721–722, 1955. [Japanese.]

It was proved experimentally [in Japan] that the necrotic mosaic virus of broad beans is not transmitted through the seed or plant residues or by aphids, but is soil-borne [cf. *R.A.M.*, 18, p. 224]. In pot experiments the virus was inactivated by heat sterilization and soil treatment with chloropicrin but not by formalin or cresol soap solution.

Erwin (D. C.) & Thomason (I. J.). **Wilt resistant Blackeye Beans.**—*Calif. Agric.*, 10, 5, p. 6, 1 fig., 1956.

In field and greenhouse tests of the new Grant variety of blackeye cowpea at the

University of California, Riverside, the authors found promising resistance to *Fusarium oxysporum* f. [*bulbigenum* var.] *tracheiphilum*. In 1955 seedling roots were dipped in a spore suspension, three isolates of the fungus being used, giving disease indexes of 0·6, 1·2, and 1·1, respectively, on a scale from 0 (no disease) to 4 (plant dead), compared with 3·5, 3·2, and 3·1 for the Chino 3 variety from which Grant was selected. In field tests Grant remained green, while two other varieties were dying from wilt. The variety is, however, susceptible to nematode injury.

Perry (B. A.) & Jones (H. A.). **Performance of short-day pink-root-resistant varieties of Onions in southern Texas.**—*Proc. Amer. Soc. hort. Sci.*, 66, pp. 350–353, 1 fig., 1955.

To obtain performance records of onion varieties recently released in Texas as resistant to pink root rot (*Pyrenochaeta terrestris*) [*R.A.M.*, 34, p. 73; 35, p. 60], trials were conducted at Laredo in 1951–2 in a heavily infested plot, and on a farm in Zapata County in 1951–2 and 1952–3. Excel, L 36, Eclipse, L 365, and the F_1 hybrids Excel (986) × L 281 W, Excel (986) × L 303, and Excel (986) × L 365 were highly resistant. L 281 W appeared to be less resistant, but gave satisfactory yields in heavily infested soil. The Grano types were very susceptible, and Granex was intermediate.

Govindjee, Laloraya (M. M.), & Raja Rao (T.). **Formation of asparagine and increase in the free amino acid content in virus infected leaves of Abelmoschus esculentus.**—*Experientia*, 12, 5, pp. 180–181, 1 fig., 1956. [German summary.]

Paper-chromatographic analyses at the Department of Botany, University of Allahabad, India, of the free amino acids and amides in healthy leaves of *Hibiscus esculentus* and those infected by yellow [vein] mosaic [*R.A.M.*, 35, pp. 69, 279, 282] revealed that there was more leucine, phenylalanine, valine+methionine, and asparaginic acid in the latter, as well as a new, ninhydrin-positive substance and asparagine.

Akai (S.) & Kunieda (K.). **Varietal differences of Eggplants in reaction to the causal bacteria of the wilt disease, Xanthomonas solanacearum.**—*Forsch. PflKr., Kyoto*, 5, 2, pp. 37–44, 1955.

The gist of the information in this paper concerning *Xanthomonas* [*Pseudomonas*] *solanacearum* causing wilt of eggplant has already been noted from another source [*R.A.M.*, 33, p. 576].

Rochow (W. F.). **Interference with Tobacco mosaic infection by Cucumber viruses 3 and 4.**—*Phytopathology*, 46, 3, pp. 133–137, 1 fig., 1956.

At the Virus Laboratory, University of California, Berkeley, infection by tobacco mosaic virus of Fordhook White Spine cucumber half-cotyledons was reduced by previous local inoculation [*R.A.M.*, 13, p. 648] with cucumber viruses 3 and 4 [cucumber green-mottle mosaic virus and a strain of it, respectively: 35, pp. 580, 583]. When the half-cotyledons were inoculated heavily (e.g., with six instead of one or three strokes of the brush) with one of the cucumber viruses, there was little or no protection against superinfection by tobacco mosaic virus [cf. 30, p. 632] after five days, but it was partial after eight, and quasi-complete after 11. In general, cucumber green-mottle mosaic virus interfered more effectually with superinfection by tobacco mosaic than did its strain.

Uschdraweit (H. A.) & Valentin (H.). **Winterwirte des Gurkenmosaiks.** [Winter hosts of Cucumber mosaic.]—*Angew. Bot.*, 30, 3, pp. 73–79, 1956.

With *Chenopodium quinoa* [*R.A.M.*, 35, p. 269], *Gomphrena globosa* *Datura*

tabacum. Numerous plants, tomato and the tobacco variety Samsun as indicators, the authors examined the expressed sap of numerous garden plants and weeds in the vicinity of large German cities for the presence of viruses of horticultural importance.

This paper reports only the findings in respect of cucumber mosaic virus, for which 60 new hosts were found. It was responsible for about two-thirds of the total number of virus infections encountered in shrubs and large perennial herbs. Pansy (*Viola tricolor*) was often heavily infected. Many hosts give little or no indication that they are infected apart from a slight reduction in growth.

Kishino (T.) & Akiyama (H.). **Studies on Cucumber mosaic virus. I. The symptoms of mosaic disease of Cucumber in Japan, and host range and properties of its causal virus.**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 13–24, 1954. [Japanese, with English summary.]

Cucumber mosaic virus was observed causing mosaic of cucumber in Tokyo in 1950. The characteristic yellow mottle and green warts on the fruits were not seen. Japanese varieties of cucumber appear to be tolerant of the virus, and symptoms are mild.

Owen (J. H.). **Cucumber wilt, caused by Fusarium oxysporum f. cucumerinum n.f.**—*Phytopathology*, 46, 3, pp. 153–157, 3 figs., 1956.

The results of cross-inoculation tests at the Department of Plant Pathology, University of Florida, with the *Fusarium* spp. causing wilt of cucumber, watermelon, and muskmelon have already been presented [*R.A.M.*, 35, p. 196]. Since the species from cucumber differed in pathogenicity from those on watermelon (*F. bulbigenum* var. *niveum*) and muskmelon (*F. n. melonis*), it is described as a new form, *Fo.* f. *cucumerinum* n.f.

Barrett (H. C.). **Black rot resistance of the foliage on seedlings in selected Grape progenies.**—*Proc. Amer. Soc. hort. Sci.*, 66, pp. 220–224, 1955.

At the University of Illinois, Urbana, 37 parental varieties, comprising 12 *Vitis vinifera* varieties, eight French hybrids, 12 American hybrids, and five wild *Vitis* species selections, also 48 F$_1$ hybrids from these, were tested by inoculation during the growing season for their reaction to *Guignardia bidwellii* [*R.A.M.*, 32, pp. 467, 662] and the parents were also tested under natural conditions of infection.

Resistance appeared to be of a multiple factorial nature. Some seedlings in most of the progenies exceeded either parent in resistance or susceptibility [cf. 34, p. 572]. The cultivated hybrid variety Mills tended to increase resistance when used as a parent. The experiment demonstrated that it is practicable to carry out artificial inoculation of seedling grape progenies in a large-scale breeding programme for black rot resistance. There was close agreement between the reaction of the parental clones to inoculation and to natural infection.

Rouzella (E.) & Chabrier (E.). **Efficacité comparée de différents sels d'ammonium quaternaire contre certains champignons phytopathogènes en viticulture en particulier.** [Comparative effectiveness of various quaternary ammonium salts against certain fungal phytopathogens particularly in viticulture.]—*C. R. Acad. Agric. Fr.*, 41, 17, pp. 741–745, 1955.

The authors examined eight quaternary ammonium compounds for their ability to inhibit the development of *Botrytis cinerea* incorporated into sterile grape must. The greatest activity was displayed by dimethyl benzyl alkyl ammonium chloride, 5 mg. of which prevented growth in a litre of must for 13 days, and 10 mg. for 19 days.

Cosmo (I.) & Pieri (G.). **Ampelopatita da non trascurare la degenerazione infettiva. Sintomatologia, trasmissibilità tentativi di lotta.** [A Vine disease not to be neglected, infectious degeneration. Symptomatology, transmissibility, control experiments.]—*Riv. Vitic.*, 8, pp. 39–44, 71–81, 1955. [Abs. in *Ber. schweiz. Bot. Ges.*, 102, 1–2, pp. 132–133, 1956.]

Information based on personal experience in Italy and on a study of the literature is presented on the external and internal symptoms, course of development, and presumptive causes of infectious degeneration [court-noué] of the vine [*R.A.M.*, 35, p. 578], as well as on the influence of the soil and rootstock.

From the results of their experiments the authors conclude that infection is transmissible to healthy vines by way of the soil, and also (in tests on 14 combinations) from scion to stock and vice versa, but not by the grape gall louse [*Phylloxera vastatrix*]. On this basis the theory of the viral origin of court-noué is upheld. Attempts to combat the disease by soil amendments with macro- and micro-elements resulted only in a retardation in the development of the disease with no complete cure. Cell inclusions were not detected in all the diseased vines examined, while conversely, not every vine containing these bodies appeared to be infected. Their diagnostic value is consequently regarded as slight.

Maramorosch (K.). **Biological transmission of plant viruses by insect vectors.**—*Bull. Torrey bot. Cl.*, 83, 3, pp. 234–237, 1956.

The author collates and summarizes the information accrued during the past 20 years concerning the transmission of plant viruses by insect vectors, the mechanism of their multiplication in the vector, in which they must be regarded as parasites, and the bearing of this upon the relationship between animal and plant viruses.

Best (R. J.). **Living molecules : a survey of recent advances in our understanding of the nature of viruses.**—*Aust. J. Sci.*, 18, 4 A, pp. 106–120, 11 figs., 5 diags., 1956.

In his Presidential Address to Section I (Microbiology, Epidemiology, and Preventive Medicine) of the 31st Meeting of the Australian and New Zealand Society for the Advancement of Science, held in Melbourne in August, 1955, the author critically discusses up-to-date information on viruses under the following headings (after a brief introduction): historical and chemical; virus–host interaction; internal structure of initiator; relative roles of protein and nucleic acid; and the virus as a whole. Most of the studies on plant viruses in the appended list of 57 titles have been noticed from time to time in this *Review*.

Hansen (H. P.). **On classification and nomenclature of viruses.**—*Contr. Dep. Pl. Path., R. vet. agric. Coll., Denmark*, 44, 26 pp., 1955. [Mimeographed.]

The writer sets out proposals for a new binomial system for plant viruses based on the means of transmission. The basic divisions are into three groups according to whether the viruses are soil-borne, readily transmitted mechanically, or normally only transmissible by vectors, the last group again being subdivided in accordance with the type of vector involved. Specific names are based on the Latin names of hosts. Races are indicated by hyphened sub-epithets and varieties.

The writer develops these proposals in detail, illustrating the suggested nomenclature with numerous examples of viruses falling in each subgroup; provision is made for those transmitted by widely different vectors, a general indicative epithet being used.

Matthews (R. E. F.) & Proctor (C. H.). **Influence of aliphatic organic acids and metal ions on numbers of local lesions produced by a Tobacco necrosis virus.**—*J. gen. Microbiol.*, 14, 2, pp. 366–370, 1956.

A co-operative project by the Virus Research Unit, Molteno Institute, University

of Cambridge, and the Plant Diseases Division, Auckland, New Zealand, demonstrated that a number of aliphatic organic acids, sprayed on the leaves of Black Prince beans (*Phaseolus vulgaris*) before and after inoculation, decreased the numbers of local lesions produced by tobacco necrosis virus [*R.A.M.*, 33, p. 204; 35, p. 584, and next abstract]. Citric and succinic acids were effective only when applied before or during the period of virus establishment. This inhibitory effect was annulled by certain metallic nitrates. It appears, therefore, that metallic ions may be significant in the successful establishment of plant viruses and that the balance between metallic ions and organic acids in the leaf at the time of inoculation may be one of the factors influencing plant susceptibility.

Pirie (N. W.). **Biochemistry department.**—*Rep. Rothamst. exp. Sta., 1954*, pp. 73–79, 1955.

Studies by G. H. Wiltshire on the influence of light on the resistance of French bean [*Phaseolus vulgaris*] leaves to infection by tobacco necrosis virus [cf. preceding abstract] showed that leaves floated in 0·003*M* solutions of malate or citrate, and then washed before inoculation, bore fewer lesions than those floated in water, but more than those in 0·03 *M* solutions. Potassium malonate had the same effect as malate and citrate. Whether the infiltrated acids accumulate or are metabolized by the leaf was not ascertained. As infiltration with these acids decreased the number of lesions equally in the light and in the dark, resistance to infection is unlikely to depend only on the concentration of any one of them. A decrease in resistance similar to that induced by darkness occurred in plants kept in the light but deprived of carbon dioxide.

Amelunxen (F.). **Beobachtungen über die Entwicklung der Eiweißspindeln bei Cactaceen (Vorläufige Mitteilung). Über die Strukturanalyse der Eiweißspindeln der Cactaceae (Vorläufige Mitteilung).** [Observations on the development of the protein spindles in Cactaceae (preliminary note). On the structural analysis of the protein spindles of the Cactaceae (preliminary note).]—*Protoplasma*, 45, 2, pp. 164–172, 18 figs.; pp. 228–240, 9 figs., 1 graph, 1956.

Further detailed evidence is presented from intensive cytological studies at the Botanical Institute of the Westphalian Wilhelms University, Münster, Germany, in support of the argument that the protein spindles in the cells of *Opuntia monacantha* and other *O.* spp. are virus particles [cf. *R.A.M.*, 33, p. 702 and following abstracts]. Under the electron microscope the fibrils of the spindles are seen to arise through a linear aggregation of single threads, 600 by 22±mμ, closely resembling those of tobacco mosaic and potato virus X.

Miličić (D.) & Plavšić (Biljana). **Eiweißkristalloide in Kakteen-Virusträgern.** [Protein crystalloids in Cactaceae-virus-carriers.]—*Protoplasma*, 46, 1–4, pp. 547–555, 6 figs., 1956.

At the Botanical Institute of the Science Faculty, Zagreb, Yugoslavia, the inoculation of a spindle-free *Epiphyllum truncatum* plant with tissue sap of *Opuntia brasiliensis* containing cytoplasmatic protein spindles and nuclear crystalloids [*R.A.M.*, 33, p. 702, and cf. preceding and following abstracts] resulted in the development of both types of inclusions within about three weeks. The vacuoles of both *O. brasiliensis* and *E. truncatum* were found to contain crystalline protein bodies, which are also interpreted as cell inclusions of virus origin.

Thaler (Irmtraud). **Eiweißkristalloide von Lilium tigrinum.** [Protein crystalloids of *Lilium tigrinum*.]—*Protoplasma*, 45, 3, pp. 486–490, 6 figs., 1956.

At the Institute for Plant Physiology, Graz, Austria, the epidermal cells of the bulb scales of *Lilium tigrinum* were found to contain protein crystalloids of variable

shape [cf. *R.A.M.*, 34, p. 455 and preceding and following abstracts], of which the most remarkable were the 'zebra spindles'. The last-named are identical in structure with those occurring in Cactaceae and are held to be virus-carriers.

REITER (LISELOTTE). **Virus Übertragung zwischen Aichryson-Arten.** [Virus transmission between *Aichryson* species.] —*Protoplasma*, 45, 3, pp. 509-511, 2 figs., 1956.

Further observations at the Institute for Plant Physiology, Graz, Austria, confirmed previous conclusions that foliar variegation in the 'indoor Aeonium' (*Aichryson* [*Sempervivum*] × *domesticum* f. *foliis variegatis*) is the expression of a virosis [*R.A.M.*, 34, p. 525]. The leaves of *A.* [*S.*] *dichotomum* are free from X-bodies, which develop, however, after grafting with a scion of the 'indoor Aeonium' containing inclusions [cf. preceding and next abstracts].

THALER (IRMTRAUD). **Proteinspindeln und anomale Zellwandbildung in der Epidermis viruskranker Impatiens holstii-Pflanzen.** [Protein spindles and abnormal cell wall formation in the epidermis of virus-diseased *Impatiens holstii* plants.]—*Protoplasma*, 46, 1-4, pp. 755-761, 9 figs., 1956.

The epidermal cells of the misshapen leaves of unusually profusely branched *Impatiens holstii* plants at the Institute for Plant Physiology, Graz, Austria, contained strikingly large numbers of protein spindles [cf. preceding abstracts] and also bore wall ridges and cystolith-like projections. The nuclei in many of the subepidermal stem cells were of exceptional size. The suspicion of a virosis [cf. *R.A.M.*, 33, p. 521] was confirmed by grafting scions from diseased plants on healthy stocks, resulting in the development in the latter of X-bodies and protein spindles.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 4, pp. 60-62, 1955.

The (United Kingdom) Importation of Plants Order, 1955, superseding the Importation of Plants Orders, 1947 to 1954, the Importation of Plants (General Licence) Orders, 1953 to 1954, and the Importation of Raw Cherries Order, 1954, came into operation on 1st April, 1955, except for the provisions relating to imports of seeds, which became operative on 1st July, 1956. The following provisions relate to diseases. The importation of living plants and parts thereof (excluding fruit, raw vegetables, seeds, potatoes, and cut flowers) is prohibited unless they have been inspected during the preceding growing season by an authorized officer of the country of origin and found to be substantially free from injurious pests and diseases, including virus diseases, and unless *Synchytrium endobioticum* has not occurred during the preceding ten years within a radius of 2 km. from the growing field.

The importation of potatoes is prohibited if *S. endobioticum* or *Corynebacterium sepedonicum* has occurred at any time within 2 km. of the growing field. The importation of lettuce seed is permitted only if the seed crops have been certified free from lettuce mosaic [virus]. Tomato seed must be from crops found to be free from *C. michiganense* or grown in a region where the disease does not occur. Similarly, pea seed for sowing must be from crops unaffected by *Pseudomonas pisi* or grown in a region free from the disease.

VAN ORSHOVEN (H.) & WILKINS (V. E.). **Progress report 1955–56, European and Mediterranean Plant Protection Organization.**—35 pp., Paris, 142 Avenue des Champs-Élysées, 1956. [With French version.]

In this report [cf. *R.A.M.*, 35, p. 224] on work in connexion with the international control of plant pests and diseases, it is stated that the Council has established, in collaboration with F.A.O., a working party of experts to discuss citrus tristeza virus [cf. 32, p. 184 *et passim*] and xyloporosis [14, p. 162 *et passim*]. Recommendations

are to be made on the steps to be taken to prevent the introduction of these diseases into or their spread within the Mediterranean area.

KLEMM (M.), MASURAT (G.), & STEPHAN (S.). **Das Auftreten der wichtigsten Krankheiten und Schädlinge der Kulturpflanzen im Jahre 1952 im Bereich der Deutschen Demokratischen Republik.** [The occurrence of the principal diseases and pests in the year 1952 in the zone of the German Democratic Republic.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 10, 4, pp. 61–93, 47 maps, 2 graphs, 1956.

During the year under review [cf. *R.A.M.*, 35, p. 417] there was heavy infection of bunt (*Tilletia tritici*) [*T. caries*] throughout Eastern Germany, resulting in the main from neglect of seed disinfection [35, p. 434].

Wilt disease (*Colletotrichum atramentarium*) of potatoes [35, p. 541] was reported from Mühlhausen, and it would appear that the disease was more widespread in central Germany than was realized.

Beet yellows virus, which in Eastern Germany had previously been confined to Sachsen-Anhalt, was reported from a number of districts in Mecklenburg.

KOMLÓSSY (G.). **Significant results of resistance examinations in variety tests.**—*Mezögazd. Kiado, 1953*, pp. 94–132, 1954. [Abs. in *Hung. agric. Rev.*, 4, 1, p. 1, 1955.]

Tests throughout Hungary showed the Russian variety of barley Krasnodarsky 2929 to be the most resistant to loose smut (*Ustilago nuda*) [*R.A.M.*, 35, p. 9], which causes heavy damage to winter varieties, followed by the Hungarian varieties Székács 31 and Karcagi 31. Krasnodarsky 2929 was also highly resistant to *Fusarium nivale* [*Calonectria nivalis*: cf. 34, p. 743] at the Nagycenk Experiment Station.

In 1952–3 infection centres for the study of *Rhizoctonia* [*Corticium*] *solani* [cf. 30, p. 538] on potato were established at Pallagpuszto and Herceghalom. The Czech variety Carmen and the Hungarian Ella were the most resistant while K. 678 and Kosubskie were the most susceptible.

GHILLINI (C. A.). **Rassegna dei principali casi fitopatologici osservati nel 1954 all 'Osservatorio Fitopatologica di Bologna.** [Review of the chief phytopathological records noted in 1954 at the Phytopathological Observatory of Bologna.] —*Notiz. Malatt. Piante, 1955*, 33 (N.S. 12), pp. 57–62, 1955.

In this review [cf. *R.A.M.*, 35, p. 91] it is stated that in 1954 the wet spring experienced in northern Italy greatly favoured the development and spread of vine downy mildew (*Plasmopara viticola*) [cf. 35, p. 658] and grey rot (*Botrytis cinerea*) [cf. 33, p. 704; 35, p. 74]. Potatoes and tomatoes were severely affected by *Phytophthora infestans*. In the vicinity of Ferrara and in the Romagna incipient attacks of pear and apple scab (*Venturia pirina* and *V. inaequalis*, respectively) [34, p. 40] were arrested by timely spraying. Fields of tobacco at Migliarino di Carpi were infected by *Phytophthora nicotianae*.

GHILLINI (C. A.) & MEZZINI (L.). **Elenco dei principali casi fitopatologici di natura crittogamica, virosica e non parassitaria osservati dal 1^0 gennaio al 31 dicembre 1954.** [List of the principal cryptogamic, virus, and non-parasitic plant diseases observed from 1st January to 31st December, 1954.]—*Notiz. Malatt. Piante, 1955*, 33 (N.S. 12), pp. 63–70, 1955.

This list of plant diseases recorded at the Phytopathological Observatory, Bologna, in 1954 [see preceding abstract] includes *Penicillium expansum* on apples at Corticella, Bologna, *Gymnosporangium sabinae* on pears at Montagnola di Mezzano, Ravenna, *Endothia parasitica* [*R.A.M.*, 35, p. 659] causing canker of

chestnut in two localities in the province of Bologna, *Ascochyta caricae* on fig at Migliarino di Carpi, Modena, *Melampsora pinitorqua* [see above, p. 732] on fir [*Abies*] at Asiago, Vicenza, *Spongospora subterranea* [27, p. 539] on potatoes at Rovigo, and *Uromyces muscari* on *Muscari comosum* at Sala Bolognese.

Thirty-sixth Report of the Quebec Society for the Protection of Plants, 1954.—96 pp., 3 pl., 9 figs., 1 map, 1956.

In this report [cf. *R.A.M.*, 35, p. 155] W. F. Hanna (pp. 23–31) summarizes the progress and problems of plant disease research in Canada, noting the new diseases of importance that have been recorded and diagnosed during the previous ten years and with special reference to research on cereal rusts [cf. 35, p. 210].

B. Baribeau (pp. 35–37) gives [in French] a short account of *Verticillium* wilt (*V. albo-atrum*) of potatoes [cf. 32, p. 502], which while of little account when the variety Green Mountain predominated has become evident on more recently introduced varieties such as Kennebec.

J. G. Coulson, R.-L. Pelletier, and J. Simard (pp. 61–66) investigated the possibilities of controlling cabbage yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*: 34, p. 135] by chemotherapeutants. After preliminary trials of the effect of a number of chemicals on the growth of the fungus on potato-dextrose agar, cabbage plants grown in sand culture for six weeks were supplied with these chemicals and then transplanted to soil after inoculating the roots with the fungus. Plants treated with benzoic acid or hydroquinone (both at 1,000 p.p.m.) or phenyl mercuric acetate (16 p.p.m.) at 40 ml. per day for four days showed much less severe symptoms than the controls watered with tap-water. In trials of cabbage varieties grown in infested soil J. Simard notes [in French] (pp. 93–94) that the genetically resistant Marion Market and Resistant Detroit had fewer infected plants, especially the former (25·6 per cent. diseased as opposed to 83·3 of the susceptible Copenhagen Market).

Kamat (M. N.). **Some new diseases of economic importance found in Bombay during 1940–1950.**—*J. Univ. Poona, Sci. Sec., 1955*, pp. 22–27, 5 figs., 1955.

Diseases of economic plants found within recent years in Bombay State and discussed by the writer include blast of rice (*Piricularia oryzae*) [*R.A.M.*, 34, p. 772 *et passim*]; papaw mosaic virus [28, p. 131; 35, p. 280]; banana mosaic virus [loc. cit.], which is stated not to be transmissible by sap, or by *Pentalonia nigronervosa*, the vector of banana bunchy top virus; a new leaf rust of sugar-cane (*Puccinia sacchari*) [*P. erianthi*: 29, p. 477]; angular leaf spot of cotton (*Xanthomonas malvacearum*) [35, p. 524]; and wilt of eggplant caused by *Verticillium dahliae* [30, p. 260], genetic resistance to which is being sought.

Annual Report of the Department of Agriculture, Jamaica, for the year ended 31st December, 1954.—69 pp., 4 pl., 1955. [Received June, 1956.]

On pp. 22–23 and 31 of this report [cf. *R.A.M.*, 35, p. 275] it is stated that as the control of banana leaf spot [*Mycosphaerella musicola*] proves more difficult on the variety Lacatan than on Gros Michel, owing to the high percentage of perithecia produced, infected Lacatan leaves were treated with various chemicals in an effort to encourage greater production of conidia as opposed to perithecia [see next abstract].

A new series of spraying trials was laid down in 1954 under the direction of Dr. H. G. H. Kearns, using sodium succinate as a wetter with Bordeaux mixture, with ligno-cellulose or sulphate lye added to the mixture.

Abnormal yellowing of Lacatan bananas was again widespread; it is possibly due to a nutrient deficiency yet to be diagnosed.

Coco-nut lethal yellowing ('unknown disease') [loc. cit.] continued to spread

inland in the western parishes, while the cutting out of infected palms was regularly carried out in Trelawny at the eastern extremity of the affected areas.

Gregory (E. J.). **Investigations 1954.**—*Bull. Dep. Agric. Jamaica* (N.S.) 54, 130 pp., 1955. [Received June, 1956].

Much of the information in the plant pathology section (pp. 33–36) of this report has already been noticed [see preceding abstract]. Among the new diseases recorded in 1954 was *Sphaceloma poinsettiae* on poinsettia (*Euphorbia pulcherrima*). The average intensity of banana leaf spot (*Mycosphaerella musicola*) on unsprayed plots at Brimmer Hall in May, 1954, was 2·68 and at Burlington 3·03, both significantly higher than on the sprayed. Sodium succinate wetter was very efficient and sulphonated lauryl sticker was better at 0·2 per cent. than at 0·1.

A new, short-term method of testing fungicides, which gives a fairly good indication of efficiency, is to spray thoroughly the opening heart leaves in a heavily infected field once, and to estimate the amount of leaf spot six to eight weeks later.

Spraying banana leaves with 2·5 per cent. sodium dihydrogen phosphate considerably increased conidial production on the spots [loc. cit.]

'Frond drop' [35, p. 366] was observed at scattered points along the north coast and elsewhere in the island. The disease appears to have been present for some years and to be similar to the conditions previously described as 'false wilt', 'drought wilt', and 'debility'.

A summary of the conclusions reached by J. Nutman and [Florence] Roberts from their investigations of coco-nut lethal yellowing ('unknown disease') [loc. cit.] is given (pp. 77–78).

Orian (G.). **Plant Pathology Division.**—*Rep. Dep. Agric. Mauritius, 1954*, pp. 72–77, 1956.

Most of the information on sugar-cane diseases in this report [cf. *R.A.M.*, 34, p. 772] has already been noticed [34, p. 321; 35, p. 329 and above, p. 720]. Red stripe [*Xanthomonas rubrilineans*: C.M.I. map No. 39] was observed on sugar-cane in the island for the first time. It had apparently existed on two grasses *Paspalum nutans* and *P. paniculatum*, which were found showing typical symptoms, and was not introduced on sugar-cane. Cross inoculations from *P. nutans* to Barbados canes gave positive results. The varieties B 3337 and B 37161 were severely affected in the field.

Maize rust (*Puccinia polysora*) was less severe than in 1953, probably owing to a drier year. The maize varieties Mexican 7, 13, and 16 from Nigeria showed promise of resistance, but some of the imported varieties appear more susceptible to [unspecified] bacterial stem rot than the local variety. Maize streak virus was observed on plots at the Richelieu Experiment Station.

Annual Reports of the Director of Agriculture, British Guiana, 1953, 1954.—45 pp., 1956; 58 pp., 1956.

Information on sugar-cane diseases in British Guiana on pp. 20–21, 40 in the first of these reports [cf. *R.A.M.*, 28, p. 427] and on pp. 9, 31 in the second has already been noticed from another source [see above, p. 720]. On p. 27 it is stated that a stem rot of jute caused by a fungus tentatively identified as *Diplodia corchori* [20, p. 447] occurred sporadically on some experimental plots in Berbice as the plants were approaching maturity. In the Pomeroon District coffee was attacked by *Sclerotium coffeicola* [19, p. 326]. A recently cleared tangerine orchard on the West Bank, Demerara, showed a condition, apparently of physiological origin, resembling 'foam' disease in Assam [32, p. 480]. Tomatoes in the hydroponic gardens, Atkinson Field, are regularly affected by severe outbreaks of *Pseudomonas solanacearum* [cf. 29, p. 64].

Nance (Nellie W.). **Some new and important plant disease occurrences and developments in the United States in 1954.**—*Plant Dis. Reptr, Suppl.* 235, pp. 136–175, 8 maps, 1955.

Most of the information in this report [cf. *R.A.M.*, 34, p. 579] has already been noticed in this *Review* from other sources.

The soil-borne wheat mosaic virus and wheat streak mosaic virus again caused heavy losses in Kansas [*R.A.M.*, 35, p. 669] in the 1953–4 season. Mosaic was prevalent in many fields in the eastern third of the State resulting in 26 per cent. loss as against 10 per cent. in the 1951–2 season. Streak mosaic, along with the early drought and extreme soil blowing, was chiefly responsible for yield reduction, the State loss amounting to some $14,000,000, second only to the 1949 outbreak when loss was estimated at $30,000,000.

Blight (*Phytophthora infestans*) was important on tomato [35, p. 494] in localized areas in Mississippi and on potato [35, pp. 318, 320] in Aroostock county, Maine, where the epidemic was the most severe in the history of the State. The green-wrap tomatoes in Georgia were free from the disease.

Koch de Brotos (Lucia) & Boasso (Celia). **Lista de enfermedades de los vegetales en el Uruguay.** [List of plant diseases in Uruguay.]—*Publ. Minist. Ganad. Agric., Montevideo*, 106, 65 pp., 1955. [Received July, 1956.]

This list of plant diseases in Uruguay arranged under bacteria, fungi, viruses, and non-parasitic disorders, brings up to date the list published in 1942 [cf. *R.A.M.*, 21, p. 129]. The common and scientific names and synonyms are provided, with notes on the distribution and importance of the diseases. These include *Pseudomonas pisi* [C.M.I. map No. 253] which is widespread and severe around Montevideo and in Salto; *P. syringae*, mildly attacking leaves of *Citrus* spp. in nurseries near Montevideo; *Xanthomonas citri* [No. 11] at present mild on lemon fruits, leaves, and branches in Salto; *X. juglandis* [No. 133] severe and widespread on walnut; *Actinomyces scabies* [*R.A.M.*, 29, p. 580] severe wherever potatoes are grown; *Synchytrium endobioticum* [C.M.I. map No. 1] on potato; *Phytophthora infestans* [No. 109] very severe on potato and tomato throughout the country, particularly in Salto; *Elsinoe fawcetti* [No. 125] on sour orange (*C. aurantium*) and lemon throughout the citrus zone; *Podosphaera leucotricha* [No. 118] and *Nectria galligena* [No. 38] severe on apples (particularly Jonathan and Rome Beauty) throughout the fruit-growing region; *Guignardii bidwellii* [No. 81] sporadically severe on vines; *Mycosphaerella arachidicola* [No. 166] and *M. berkeleyii* [No. 152] severe on groundnuts in the north; *M. fragariae* on strawberry [No. 110], chiefly in the south; *Venturia inaequalis* [No. 120] severe on apple; *Ophiobolus miyabeanus* [No. 92] sporadic on rice; *O.* [*Cochliobolus*] *sativus* [No. 322] severe on barley and summer wheat; *Pseudopeziza medicaginis* [No. 129] severe on lucerne, *Medicago hispida* var. *denticulata*, and *M. arabica* var. *maculata* throughout the country; *Sclerotinia fructigena* [No. 22] and *S. laxa* [No. 44] severe on *Prunus* spp.; *Ustilago avenae* [No. 238] sporadically severe on oats; *U. maydis* [No. 93] severe on maize; *Tilletia caries* [No. 294] and *T. foetida* [No. 295] severe on wheat; *Uromyces appendiculatus* [No. 290] on string beans (*Phaseolus vulgaris*); *U. betae* [No. 265] on wild and sugar beet; *Puccinia arachidis* [No. 160] on *Arachis marginata* in the department of Rivera; *P. glumarum* [No. 97] severe on wheat and also attacking barley, rye, and other Gramineae; *P. psidii* [No. 181], occasionally severe on guava; *P. sorghi* [No. 279] on maize; *Melampsora lini* [No. 68], sporadically severe on flax; *Septoria lycopersici* [No. 108], occasionally severe on tomato; *S. nodorum* [No. 283], severe on summer wheat; *Clasterosporium carpophilum* [No. 188], occasionally severe on *Prunus* spp.; *Botrytis fabae* [No. 162] on broad bean (*Vicia faba*); *Piricularia oryzae* [No. 51], consistently important on rice; *Cercospora beticola* [No. 96], severe on sugar beet and chard; *Alternaria solani* [No. 89] on potato; *Fusarium lini*

[No. 32] on flax: *Lycopersicon* virus 3 [tomato spotted wilt virus: No. 4] on tomato: *Beta* virus 3 [beet curly top virus: No. 24] on sugar beet and chard: and tristeza virus [No. 289] on citrus.

STOLP (H.). **Bakteriophagenforschung und Phytopathologie. (Ein Sammelreferat.)** [Bacteriophage research and phytopathology. (A compilation.)]—*Phytopath. Z.*, **26**, 2, pp. 171–218, 1956.

Outstanding developments in the history of bacteriophage research during the four decades since the independent discovery of the phenomenon by TWORT (*Lancet*, 189, pp. 1241–1243, 1915) and d'HÉRELLE (*C. R. Acad. Sci., Paris*, 165, pp. 373–375, 1917) are traced and discussed in relation to plant pathology. Many of the 371 contributions to the literature consulted in the preparation of the survey have been noticed from time to time in this *Review*.

ROSAS (C. F.). **Bacterias fitopatogénicas do Brasil.** [Phytopathogenic bacteria of Brazil.] *Agronomia Rio de J.*, 13, 3–4, pp. 235–241, 1 map, 1954. [Received May, 1956.]

This is an annotated list of 32 bacteria, plant pathogens occurring in Brazil, accompanied by references to hosts, distribution and Brazilian literature for each species. Mention may be made of *Pseudomonas rosea* (ARNAUD) n. comb. and *Xanthomonas vesicatoria* on *Ricinus communis*, *P. angulata* (C.M.I. map No. 321) on tobacco, *P. mangiferae-indicae* on mango, cashew, and by artificial inoculation on *Spondias mangifera*, *P. [melocactus f.sp.] passiflorae* [No. 35] on *Phaseolus vulgaris*, *X. begoniae* on begonia, *X. nigromaculans* f.sp. *cucurbitae* on *Zinnia elegans*, and *X. phaseoli* var. *sojense* on soy-bean.

HILDEBRANDT (A. C.) & RIKER (A. J.). **Inhibition by alcohols of diseased plant growths in tissue culture.** *Cancer Res.*, 15, 7, pp. 517–522, 7 graphs, 1955.

In continued investigations at the University of Wisconsin on the inhibition of growth of tissue cultures [*R.A.M.*, 34, p. 216], crown gall (*Agrobacterium tumefaciens*), leaves of marigold [? *Tagetes patula*], Paris daisy [*Chrysanthemum frutescens*], periwinkle [*Vinca rosea*], and sunflower, and normal apical tobacco stem tissue were incubated on synthetic media, with or without 2 per cent. sucrose but with butanol, dulcitol, ethanol, glycerol, mannitol, methanol, and propanol at a range of concentrations up to 4 per cent., and erythritol up to 2 per cent. Without sucrose, the marigold, Paris daisy, and tobacco tissues grew only with glycerol and sunflower in addition grew slightly with dulcitol, mannitol, or methanol. Periwinkle grew with all except butanol and propanol. In the presence of sucrose growth varied with the alcohol and the species concerned, but propanol proved the most inhibitory, followed by butanol and then ethanol.

GARBER (E. D.), SHAFFNER (SUSAN O.) & GOLOMB (W.). **The virulence of biochemical mutants of Erwinia aroideae for varieties of Radish and Turnip.**—*J. gen. Microbiol.*, **14**, 2, pp. 261–267, 1956.

In further studies at the Department of Botany, University of Chicago, 39 biochemical mutants of *Erwinia aroideae* strain RK [cf. *R.A.M.*, 34, p. 216] displayed a pattern of virulence and avirulence for nine varieties of radish and three of turnip similar to that previously reported for certain host species [loc. cit.]. When most of the fleshy storage organs were inoculated the hosts responded with uniform resistance, uniform susceptibility, or a variable reaction in which some individuals within a variety were resistant to a given mutant and others susceptible. Prototrophic reversions from an avirulent mutant requiring arginine and from an uncharacterized mutant with diminished virulence were as virulent as the parental strain for all varieties of radish and turnip tested.

THOROLD (C. A.). **Observations on Cacao pod production in relation to the incidence of black pod disease, caused by Phytophthora palmivora.**—*J. hort. Sci.*, 31, 3, pp. 149–155, 1956.

Black pod disease (*Phytophthora palmivora*) of cacao in Nigeria [*R.A.M.*, 35, p. 515] causes annual losses estimated as equivalent to 15,000 tons of dried beans. In experimental work the incidence of the disease may be summarized in terms of black pods expressed as a percentage of the total number of pods produced over the season, assuming that this total number is not affected by the treatments applied. Reynaud [*Bull. Cent. Rech. agron. Bingerville* 7, pp. 3–19, 1953] has thrown doubt on the validity of this assumption, and the author [*R.A.M.*, 35, p. 164] has reported a lower mean total number of pods for sprayed than for unsprayed trees in field trials with one per cent. carbide-Bordeaux mixture.

In the present work he reports studies on black pod percentages and total pod numbers in plots with different spacings (8 × 8 and 15 × 15 ft.), in which the black pods were removed frequently (every other day) or infrequently (once a month).

Statistical analysis of the results showed that with frequent black pod removal an increase in the total number of pods is accompanied by an increase in black pod percentages and that when black pods are removed frequently their occurrence early in the season tends to be associated with greater total numbers of pods.

Reynaud had found that the percentage of diseased pods was proportional to the total number of pods up to about 25 per tree, but that for larger individual tree yields an inverse relationship appeared to develop. This latter was not found to occur in Nigeria. Observations in the Gold Coast [cf. 35, p. 360] have indicated that significant increases in the number of pods per tree were associated with decreasing intervals between pickings, and the author concludes that the relationship between total numbers of pods and black pod percentages applying to frequent removal is modified towards independence as removal becomes less frequent.

MCLAUGHLIN (J. H.). **El Phytophthora palmivora Butl. y un insecto membrácido como causantes del cherelle wilt en Costa Rica.** [*Phytophthora palmivora* Butl. and a membracid insect as agents of cherelle wilt in Costa Rica.]—*Suelo tico*, 9, 35, pp. 167–175, 1956.

This is a résumé of the theses of R. Bartolomé [*R.A.M.*, 31, p. 424], A. Gonzalez R., and D. Torres S., embodying their investigations on cherelle wilt of cacao on the La Lola plantation of the Inter-American Cacao Centre, Turrialba, Costa Rica, covering the period from 1949 to 1951. The results left no doubt that *Phytophthora palmivora* [35, p. 514] and an [unnamed] membracid insect are jointly responsible for the disease, but it was found impracticable to assess their relative importance. Furthermore, there is a third factor to be considered, i.e., the physiological wilting associated with a severe drought, such as occurred in September, 1950.

In comparative inoculation experiments with *P. palmivora*, *Colletotrichum glocosporioides* [*Glomerella cingulata*: 35, p. 14], *Diplodia* [*Botryodiplodia*] *theobromae*, and *Fusarium moniliforme* [*Gibberella fujikuroi*] on injured and intact peduncles and [intact] cherelles, the percentages destroyed by the first-named were 98, 94, and 62·7, respectively. There were no significant differences between the organs inoculated with the other species (14 to 18·7) and the untreated (14·7 to 18·7).

WEHRLE (VALERIE M.) & OGILVIE (L.). **Effect of ley grasses on the carry-over of take-all.**—*Plant Path.*, 4, 4, pp. 111–113, 1955.

An account is given of an experiment conducted from 1950 to 1954 on a part of Handley Common, Dorset, which had been heavily cropped with cereals during the war years and where wheat had been severely affected by take-all (*Ophiobolus graminis*) [*R.A.M.*, 21, p. 133; 23, p. 338 *et passim*] in 1948–9, to test the

effects on the carry-over of the disease on the commonly used grasses, timothy (*Phleum pratense*) [cf. next abstract], meadow fescue [*Festuca elatior*], perennial rye grass [*Lolium perenne*], and cocksfoot [*Dactylis glomerata*]. The site was cropped with winter wheat in 1949–50 to ensure abundant inoculum, and in the spring of 1950 was divided into two blocks of four strips of equal width, which were sown with the four grasses, together with white clover [*Trifolium repens*]. The whole area was grazed by sheep in 1950–51. Examination of random samples of the grass roots on 1st November, 1950, showed that all four grasses had become heavily infected at an early stage. The area was then divided across the strips into three equal blocks, which were ploughed up and drilled with Bersée wheat in the autumns of 1951, 1952, and 1953, respectively, and thereafter cropped with autumn-sown Bersée wheat until 1954. The effect of the four grasses in the leys of one, two, and three years' duration was assessed by sampling the wheat roots at the end of each season. Grab samples, each of a handful of stubble, were taken every ten paces along a diagonal of each plot.

In 1952 root infection of the wheat was low, indicating that none of the grasses had carried over infection more markedly than the others. After harvest in 1954, there was a marked increase in the amount of root infection and a corresponding decline in yield, according to the number of years wheat had been grown on the block, but there was no evidence of any difference in the amount of root infection or in yields that could be attributed to the grasses.

Bjaanes (M.). **Den ensidige korndyrkning og fotsykdommene.** [The monoculture of cereals and foot rots.]—*Norsk. Landbr.*, *1956*, 13, pp. 299–300, 1956.

Of the two foot rots associated with the monoculture of cereals in Norway, *Ophiobolus graminis* [*R.A.M.*, 9, p. 624] and *Cercosporella herpotrichoides* [13, p. 433], the former is the more frequent and destructive. Essential information on both pathogens is summarized in popular terms, with special reference to *O. graminis*, which is most destructive on wheat but also attacks barley, rye, and most pasture and wild grasses. Among the latter couch grass [*Agropyron repens*] is one of the most active agents in the spread of infection. Timothy [*Phleum pratense*: cf. preceding abstract] is much more resistant than most other grasses. The fungus is more prevalent on light, loose soils than on the heavier and more compact, and its development is favoured by cold, wet conditions in the early summer. Suitable forerunners in the rotation for wheat and barley [cf. 33, p. 617 *et passim*] are all kinds of root crops, peas, a mixture of clover and *P. pratense*, and oats, while bare fallowing is almost indispensable in large-scale cereal cultivation.

Barley appears to be particularly susceptible to *C. herpotrichoides* in areas where it has been cultivated for many years alternately with wheat, another important host. Rye is also liable to infection, while oats are fairly resistant and may be used in the rotation, together with potatoes, red clover, *P. pratense*, and peas.

Guyot (L.) & Massenot (M.). **Observations et expérimentations sur la rouille noire des céréales et des Graminées au cours des années 1951 à 1953.** [Observations and experiments on black rust of cereals and Gramineae during the years 1951 to 1953.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Epiphyt.*), 6, 1, pp. 89–118, 1955.

An account is given of further work at the National School of Agriculture, Grignon, France, on *Puccinia graminis* [*R.A.M.*, 32, p. 121; 34, p. 291]. The main points dealt with are the natural development of the rust on rye, wheat, and oats, the behaviour of different wheat varieties in the field, experimental glasshouse infection of *Berberis vulgaris* seedlings, and glasshouse experiments with strains of the fungus.

In all three years the rust appeared first on rye (first half of June), then wheat (second half), and finally oats (first half of July). The grasses *Aegilops* sp., *Briza media*, and *Poa alpina* were very severely attacked.

The wheat varieties 80 3, 90–2, Oro, and Thatcher sustained no loss or damage from rust in 1951 and 1952, nor did Guatrache and McMurachy in 1951, Regent in 1952, and Cadet, Carleton, de M. Wauters, Frontana RL 2336, Gabo, Hope 1237, Hope × Reliance, Hope × Timstein RL 2477, Kenya A, Klein 40, Klein Anniversario, Marquis × Emmer, Newthatch (C.I. 12, 318), Pilot, Regent 975, Renown 7166, (RL 2267 × Redman) RL 2325, (RL 2267 × Redman) RL 2564, and Utracan in 1953. Khapli 4103 and Vernal 3686 were highly resistant to several races in greenhouse tests. Only Thatcher (one line) and Thatcher × Burpreza were immune from race 40, which is the most virulent strain present in France. Races 19, 40, and 133 were isolated for the first time in the country. Race 17 was isolated 23 times (once from *Hordeum leporinum*), race 21 ten times (once from *Elymus europaeus* and once from barley), race 14 six times (once from *Aegilops ovata*), race 15 five times (once from *H. murinum*), race 40 four times, race 133 twice [in the table] or four times [in the summary], and race 19 twice. A table is given showing, for the period considered, the distribution of the biological races of *P. graminis tritici* in France according to the year, the geographical area, and the wild hosts.

Of four strains isolated from barley, three conformed to *P. graminis* f.sp. *tritici* and the other to f.sp. *secalis*. Altogether ten more isolates of f.sp. *secalis* were taken, four from rye, five from *Agropyron repens*, and one from *Elymus europaeus*. Three isolates of f.sp. *avenae* came from oats and one from *Cynosurus echinatus*.

Machacek (J. E.). **Co-operative seed treatment trials—1955.**—*Plant Dis. Reptr*, 40, 1, pp. 33–36, 1956.

In 1955 19 seed dressings were tested at 25 different stations in Canada for the control of *Tilletia caries* and *T. foetida* on wheat [*R.A.M.*, 35, p. 599], *Ustilago avenae* and *U. kolleri* on oats [35, p. 442], *U. hordei* on barley [35, p. 441], and [unspecified] seed rot of flax. All the treatments were effective on wheat artificially contaminated with *T. caries* and *T. foetida*, the following reducing infection from 30·1 per cent. (control) to a trace (less than 0·1 per cent. smutted heads): ceresan M dust (0·5 oz. per bush), aldmer wettable dust at 2 oz. (a wettable dust of 40 per cent. aldrin and 2 per cent. mercury as mixed phenyl mercury acetate and ethyl mercury chloride: Chipman Chemicals Ltd., Winnipeg), canuck mercury-aldrin, a similar dust (2 oz.), canuck organic mercury wettable dust (5 per cent. mercury at 0·5 oz.), canuck liquid mercury at 0·75 oz. (3·6 per cent. mixed phenyl mercury and ethyl mercury acetates)—all three produced by J. J. Hambley Hatcheries Ltd., Winnipeg, co-op. dual-purpose ST wettable dust (40 per cent. aldrin plus 2 per cent. mercury at 2 oz.), co-op. liquid mercury (4 per cent. phenyl mercury ammonium acetate at 0·75 oz.)—both by the International Co-operatives Ltd., Winnipeg, mercury-heptachlor dust (40 per cent. heptachlor and 2 per cent. mercury at 2 oz.), san with 5 per cent. oil (a non-wettable dust, 5 per cent. mercury at 0·5 oz.)—both by Sherwin-Williams Co. of Canada Ltd., Montreal, panogen 15 (0·75), and MEMA 4 (0·75).

Ceresan M (1·5), canuck organic mercury (1·5), ceresan M-ND (similar to ceresan M but with dustiness reduced; 1·5), co-op. dual-purpose ST (5), and san with 5 per cent. oil (1·5) gave the most promising results on flax, but the seed used was poor and some 20 per cent. reduction in seed rot, from 82·3 per cent. in the control, was the best result obtained. The control of smut on oats and barley was inadequate, presumably owing to the drastic method of inoculating the seed; with natural infection it would probably have been more favourable. Oat seeds treated with products containing aldrin produced seedlings with bleached green tissues at the apex of the first leaf, though subsequent leaves were unaffected.

Pady (S. M.), Johnston (C. O.), Haskett (W. C.), Sill (W. H.), Hansing (E. D.), Fellows (H.), Rogerson (C. T.), & Frazier (J. C.). **Diseases of Wheat in Kansas.**—*Bull. Kans. agric. Exp. Sta.* 368, 24 pp., 15 figs., 1 graph, 1955.

This publication describes in popular terms the diseases of wheat in Kansas. The most serious of these are leaf and stem rust [*Puccinia triticina* and *P. graminis*: *R.A.M.*, 35, p. 362], the latter causing heavy losses only in certain years, and the soil-borne mosaic and streak mosaic viruses of comparatively recent origin [35, p. 669]. Unspecified root rots also cause considerable damage.

Holton (C. S.), Kendrick (E. L.), & Elliott (F. C.). **Exotic sources of known types of smut resistance in Wheat varieties.**—*Agron. J.*, 48, 5, pp. 243-244, 1956.

In studies on the reaction of wheat varieties to bunt in the Pacific Northwest [*R.A.M.*, 34, p. 142, and next abstract] 13 spring wheats were inoculated with each of the 25 standard races of *Tilletia caries* and *T. foetida*, the kernels being blackened by dipping in a spore suspension in methyl cellulose and then sown in the autumn at the Pendleton Branch Experiment Station, Oregon. The results are tabulated, with the exception of the reactions of Kenya Farmer and Purplestraw which were susceptible to all the test races. A durum variety, C.I. 3255, exhibited a typical Ridit reaction [loc. cit.], the first indication that this type of resistance is found in varieties other than Florence derivatives. Onas, Federation, and Klein Aniversario, and to a lesser extent, Baart exhibited the reaction controlled by the gene M_2 [30, p. 221]. The major resistance possessed by Martin [loc. cit.] was exhibited by the hybrid Reliance-1018 × Mercury. The remaining test varieties exhibited few additional types of bunt resistance. Reliance–1018–Mercury × Rio was highly resistant to all races except T–13 and L–9; only minor resistance was expressed by Selkirk [35, p. 597] in being highly resistant to T–14 but susceptible to the remaining races.

Holton (C. S.), Vogel (O. A.), Kendrick (E. L.), & Elliott (F. C.). **The reaction of varieties and hybrid selections of Wheat to physiologic races of Tilletia caries and T. foetida.**—*Agron. J.*, 48, 6, pp. 276–278, 1956.

The authors report the reaction of 77 varieties and hybrid selections of wheat and other breeding stock to 25 physiologic races of common bunt (*Tilletia caries* and *T. foetida*) in the Pacific Northwest [see preceding abstract], based on results obtained from 1945 to 1955. The races used and procedures followed have already been described [*R.A.M.*, 25, p. 209].

The data suggest at least six major and six minor reaction types among the 77 varieties tested. Between the extremes of high susceptibility (group I) and high resistance (group VIa) some groups were highly susceptible to some races and highly resistant to others, while some varieties also exhibited different degrees of susceptibility and resistance to the same races.

The second major reaction type (II) was characterized by contrasting high resistance and high susceptibility to about half of the races, respectively. This group represents the Martin type of resistance [30, p. 221] typified by Elmar.

Varieties in group III showed high resistance to all races except T–16 [35, p. 667] and L–8, typical of the T resistance gene [loc. cit.]. Two modified versions of this reaction were exhibited by the varieties in groups IIIA and IIIB. Those in the former were only moderately susceptible to T–16 and L–8, as shown by the reaction of Sel. 27–3, while those in IIIB were susceptible to T–16 and resistant to L–8.

The reaction type IV resembled the Ridit reaction [25, p. 209] in its suceptibility to 11 and 13 of the 'T' races and 9 and 10 of the 'L' races. All of the six representatives of this group were derivatives of wheat × grass hybrids of obscure pedigree.

The one representative of group V was similar to Hohenheimer in reaction. The sixth group showed high resistance to all races, though several races produced more than 1 per cent. smut. The varieties 27–15 × Rio-Rex-53, 27–15 × Rio-Rex-41, 27–15 × Rio-Rex-10–1, 27–15 × Rio-Rex-74, Utah 175a–53, Elgin 19 × Elmar (two selections), and the newly released Omar (C.I. 13072) constituting group VIa were highly resistant to all races, only trace amounts of bunt being produced by not more than three races. Omar is the most bunt-resistant variety ever recommended for commercial production in the Pacific Northwest.

Le Tourneau (D.). **Catalase activity of seedling Wheat leaves infected with stem rust.**—*Bot. Gaz.*, 117, 2, pp. 153–155, 2 graphs, 1956.

A preliminary account of this work at the Institute of Agriculture, University of Minnesota, has already been noticed [*R.A.M.*, 35, p. 5].

The catalase activity of the first seedling leaf of the wheat variety Little Club susceptible to races 15B, 38, and 56 of *Puccinia graminis* [f.] *tritici*, and of Mindum and Vernal to race 15B was 2 to 8 per cent. higher during the first two or three days of infection than that in non-inoculated leaves. Activity may, at the time rust flecks appear, drop slightly (one to ten per cent.) below that in the controls. Later, at the onset of uredospore production, activity rose above that of controls and continued to rise until spore production was abundant. This increased activity appeared to be due to the spores. In several experiments uredospores of races 56 and 15B displayed high activity.

In the first two or three days after inoculation of resistant hosts (varieties Einkorn, Vernal, Mindum, and Khapli with race 56, and Khapli with 15B) there was a marked increase (18 to 20 per cent.) in catalase activity in the first leaves compared with the controls. As the rust developed catalase activity was sustained at the higher level for 10 to 12 days, after which it decreased.

Farkas (G. L.) & Király (Z.). **Studies on the respiration of Wheat infected with stem rust and powdery mildew.**—*Physiol. Plant.*, 8, pp. 877–887, 1955.

A preliminary report of these studies on the effect of infection by *Puccinia graminis* and *Erysiphe graminis* on respiration in wheat has already been noticed from another source [*R.A.M.*, 34, p. 441]. Respiration of both healthy and infected plants was highly sensitive to azide. Oxygen uptake of healthy tissues was not affected by cyanide, but with infection considerable cyanide sensitivity developed. The results are considered to support the theory that the Pasteur effect (suppression of carbohydrate breakdown in air) is abolished in infected plants and aerobic fermentation induced.

Yamada (M.). **The sporulation-inhibitive effects of sulfadiazine on Wheat leaf rust. 1. Some experimental results with Wheat seedlings.**—*Ann. phytopath. Soc. Japan*, 19, 3–4, pp. 146–148, 1955. [Japanese, with English summary.]

The writer found that the development of the uredosori of *Puccinia triticina* on susceptible wheat varieties was inhibited by soil applications of an aqueous solution of sodium sulphadiazine [*R.A.M.*, 32, p. 273] at 40 mg. per 100 sq. cm. up to nine days before inoculation or within two days after. Later application was decreasingly effective. Phytotoxic effects of stunting and chlorosis were marked. The result of spraying (1,000 p.p.m. plus 1 per cent. tween-20 [loc. cit.]) was poor in comparison. The effects of sulphadiazine were counteracted by *p*-aminobenzoic acid.

Hassebrauk (K.). **Europäische Gelbrostkonferenz am 21. und 22. Februar 1956 in Braunschweig.** [European conference on yellow rust in Brunswick, 21st and 22nd February, 1956.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 6, pp. 86–87, 1956.

At the first European conference on yellow rust (*Puccinia glumarum*) [see next

abstract], held at Brunswick in February, 1956, K. Hassebrauk, speaking on the biology and epidemiology of the fungus, which he considered should be termed *Puccinia striiformis* [*R.A.M.*, 30, p. 602], drew attention to its low optimum and maximum temperatures, which encouraged winter infection while jeopardizing survival in the summer. Eva Fuchs discussed race specialization [see next abstract]. Schelling reported that at Hoofddorp, Holland, four varieties (R 3501/38, Chinese 66, von Riebesel 54/41, and the summer wheat Hope×Finstein) are chiefly used in breeding for seedling resistance. For field resistance Ridit, Garnet, Reichersberg 39 and 42, Panter, and Leda are useful parent varieties.

F. Wienhues gave an account of breeding for resistance at the Max Planck Institute for Plant Breeding Research, Köln-Vogelsang, where *Triticum spelta album*, Lin Calel, Ridit, Medsched, and Chinese 166 have been found to possess important resistance. Much interest attaches to attempts to incorporate the resistance of *Agropyron intermedium* into cultivated wheats. J. A. J. Veenenbos reported the results of Dutch trials of chemical measures against various cereal rusts. Zineb has given good, though not always economic, protection and is considered worth further investigation.

Fuchs (Eva). **Der Stand der Rassenspezialisierung beim Gelbrost Puccinia glumarum (Schm.) Erikss. et Henn. in Europa.** [The position of race specialization in yellow rust, *Puccinia glumarum* (Schm.) Erikss. & Henn. in Europe.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 6, pp. 87–93, 1 diag., 1956.

At the first European conference on yellow rust (*Puccinia glumarum*) [see preceding abstract] all races at present known were incorporated into a single list totalling 57 [*R.A.M.*, 29, p. 322], and a standard method of evaluating symptoms on test hosts was elaborated which incorporates the views of a number of workers and indicates (*a*) the type of symptoms, (*b*) their severity, and (*c*) the stage of development of the host expressed according to Feekes' Scale [not Fukes: cf. 34, p. 635]. 'Race M' of Manners [29, p. 609] was incorporated as race 57. His 'race G' from *Dactylis glomerata* was considered to be a distinct variety on the ground that it gave reaction type i (highly resistant) on all the host plants, including *Dactylis*.

The author considers that the delimitation of races according to the mode of germination of the uredospores [29, p. 149] will prove unsatisfactory, being conditioned to a considerable extent by the environment. Also, some races may prove to be biotypes *sensu* Chester [26, p. 239] as has already been foreshadowed in the work of Manners.

The 11 test host varieties of Gassner and Straib [12, p. 272] have proved to be useful and should continue to do so provided that the resistant qualities of each can be kept constant. This range should be retained as a basis and expanded according to need by the addition of other hosts suited to different regions.

The author reports that the Nederlands Graan-Centrum has assembled a provisional test range ('Fangsortiment') comprising 48 summer varieties and 11 winter varieties, chosen to include a range of susceptibility and of rates of development. These were cultivated at 38 places in Europe in the autumn of 1955, but no results have yet been published. In future years it is hoped to develop a broad spectrum of host plants and at the same time test the resistance of a few varieties each year.

Four tables are included: (1) a complete list of known races, with symptoms on indicator host varieties; (2) details as to the origin of the races; (3) the races affecting wheat, with symptoms induced in the host range of Gassner and Straib, supplemented by the variety Fong Tien and *Triticum dicoccum tricoccum*, and (4) the races affecting cereals other than wheat, with symptoms in the host range as in (3), supplemented by a further seven varieties.

Ismailov (K. A.). **Micro-elements and the increase of resistance in Wheat to yellow rust.**—*Dokl. Akad. Nauk.* [*Proc. Acad. Sci.*] *Azerbaijan S.S.R.*, 10, 7, pp. 491–494, 1954. [Abs. in *Soils & Fert.*, 19, 2, p. 202, 1956.]

Combinations of boron, manganese, copper, and zinc applied to the soil before sowing, with and without basic nitrogen and phosphorus, reduced attacks of yellow rust [*Puccinia glumarum*] in wheat, and sprinkling the plants with boron and manganese solutions checked further rust development. Increases in yield varied from 2·8 to 3·5 centners [1 centner = 100 lb.] per ha.

Meiners (J. P.), Waldher (J. T.), Hardison (J. R.), & Fenwick (H. S.). **Additions to the host range of dwarf bunt.**—*Plant Dis. Reptr*, 40, 1, pp. 26–27, 1 fig., 1956.

Since the publication of the previous host list for dwarf bunt (*Tilletia controversa*) [cf. *R.A.M.*, 35, pp. 433, 597] the following new hosts were recorded in 1955: *Agropyron inerme*, *A. trachycaulum*, *A. trichophorum*, and *Bromus marginatus*. The last mentioned constitutes the first record of *T. controversa* on the genus *Bromus*.

Király (Z.) & Lelley (J.). **Contributions to the hypersensitive reaction of Wheat to loose smut (Ustilago tritici (Pers.) Rostr.) infection.**—*Phytopath. Z.*, 26, 2, pp. 143–146, 1 diag., 1956.

A defence reaction in wheat to *Ustilago tritici*, described by Oort from Holland [*R.A.M.*, 26, p. 445] and designated by Gäumann [29, p. 371] as a parabiontic relationship, has been observed in Hungary in two out of six winter varieties, Hatvani 37/1 and Mindenes, inoculated with a biotype of the smut from a spring wheat by the floral injection method [25, p. 30]. Through the operation of this hyperergic reaction the pathogen is killed or its growth inhibited, the disease fails to develop, and the host, though making poor growth, if it survives, produces a healthy ear. The hypothesis that such plants may be regarded as actually recovered from the infection was proved by microtechnical methods [14, p. 746], which uniformly demonstrated the presence of hyphae in the culms but their absence from the highest nodes and the ears of hyperergic plants.

Stevenson (I. L.). **Antibiotic activity of actinomycetes in soil and their controlling effects on root-rot of Wheat.**—*J. gen. Microbiol.*, 14, 2, pp. 440–448, 3 graphs, 1956.

A preliminary investigation of the antagonistic relationships between ten antibiotic-producing actinomycetes (unidentified *Streptomyces* spp.) [see below, p. 783] and the wheat root rot pathogen *Helminthosporium sativum* [*Cochliobolus sativus*: cf. *R.A.M.*, 33, p. 754] in three natural soils was made at Rothamsted Experimental Station and the Department of Agriculture, Ottawa. Antibiotics were produced by the actinomycetes only in sterile soils supplemented by a suitable organic source, the greatest accumulation occurring in a neutral soil containing 2·5 per cent. glucose, while there was little or none in acid or alkaline soils under similar conditions. Some antibiotics, however, were recovered from inoculated acid soil following neutralization and the addition of glucose. Other supplements, though less effective than glucose, were 3 per cent. fresh grass or clover and 2 per cent. soybean meal.

In sterile soil in the greenhouse all the actinomycetes tested significantly reduced the degree of root rot of wheat seedlings caused by *C. sativus*. A correlation between disease incidence and degree of antagonism exhibited by individual actinomycetes *in vitro* was observed in neutral and alkaline soils, suggesting that antibiotics were responsible for the disease reduction. No such relationship was observed between disease control and the antibiotic-producing abilities of the actinomycetes in soil as determined by standard assay procedures.

The possibility remains that relatively high antibiotic concentration may be attained in the immediate vicinity of the antagonists, even though the total quantity of antibiotic per gm. of soil may be too small to be detected. The frequent failure to relate the activity of antagonists *in vitro* and in soil may therefore be due partly to the inadequacy of existing techniques for detecting antibiotics in soil [cf. 35, p. 701].

TASUGI (H.), NAKAYA (K.), & SUZUKI (N.). **A proposed method for estimating loss in yield of Wheat caused by take-all (Ophiobolus graminis Sacc.).**—*Ann. phytopath. Soc. Japan*, 19, 1–2, pp. 29–32, 1 graph, 1 diag., 1954. [Japanese, with English summary.]

The writers devised a method of estimating 20 to 30 days before harvest the losses of wheat in Japan due to take-all (*Ophiobolus graminis*). Random rows 180 cm. long were chosen in 20 plots and the average culm lengths, total number of culms, total grain yields, and weight of 1,000 grains per plant recorded. Disease severity, as expressed by decrease in culm length and yield of grain, fell into three groups, none or light, moderate, and heavy. Optimum infection occurs twice in the growing period, in autumn and early spring, and the earlier the infection, the worse the damage.

IKEDA (T.), HIGASHI (S.), & ONO (S.). **Studies on the resistance of Wheat and Barley varieties to ear-scab disease (Gibberella saubinetii). III. Studies on the varietal differences in relation to the enlargement of scab-spots.**—*Bull. Div. Pl. Breed. Tôkai-Kinki agric. exp. Sta.* 2, pp. 69–75, 5 figs., 3 graphs, 1955. [Japanese, with English summary.]

Further observations on ear scab (*Gibberella saubinetii* [*G. zeae*]) of wheat and barley in Japan [*R.A.M.*, 35, pp. 174, 668] showed that there was more rapid enlargement of the disease spots on the lemmae of susceptible than of resistant varieties, the former having more parenchymatous tissue on the inner side with larger cells and thinner walls. There was also a greater water content in the early stages and higher sugar (glucose and fructose) shortly after flowering.

HIRATA (K.). **Some observations on the relation between the penetration hypha and haustorium of the Barley mildew (Erysiphe graminis DC.) and the host cell. I.**—*Ann. phytopath. Soc. Japan*, 19, 3–4, pp. 104–108, 7 figs., 1955. [Japanese, with English summary.]

In studies of the parasitism of barley by *Erysiphe graminis* [cf. *R.A.M.*, 34, p. 382] the writer found that when grown on onion scales, previously immersed for some time in alcohol and then washed in water, the germ-tubes of *E. graminis* lived for a week, but on living leaves of mildew-resistant barley varieties the penetrating hypha was surrounded by a callus and killed within a day or two, apparently by substances produced near the point of entry and not mechanically by the callus.

A few days after inoculation both living and dead haustoria are seen within the same epidermal cell. If infected leaves are detached and kept in a moist dish, haustoria may remain alive in dying epidermal cells. Haustorial primordia were observed occasionally in the epidermal cells of buckwheat, but no hyphal development ensued.

MOSEMAN (J. G.). **Sources of resistance to powdery mildew of Barley.**—*Plant Dis. Reptr*, 39, 12, pp. 967–972, 1955.

In co-operative investigations by the Field Crops Research Branch, United States Department of Agriculture, and the North Carolina State Agricultural Experiment Station 229 of the 6,273 entries from the world collection of barley tested in the greenhouse in 1950 against a composite of races 4, 9, and 14 of powdery

mildew (*Erysiphe graminis*) [*R.A.M.*, 34, p. 778] were resistant. Of these, 205 were retested against individual races (3, 4, 8, 9, 11, 12, 14, and the new California race 3) [33, p. 531] from 1951 to 1955 and 120 of the most resistant, mostly spring barley types from India, France, and Germany and winter types from Germany, were selected. Sixteen varieties either having one gene for resistance to California race 3 or showing high resistance both in the field and in the greenhouse were crossed with the widely adapted spring variety Manchuria (C.I. 2330) and the winter varieties Randolph (C.I. 6372) and Reno (C.I. 6561) to add those sources of resistance to the adapted varieties.

Allen (T. C.) & Houston (B. R.). **Geographical distribution of the Barley yellow-dwarf virus.**—*Plant Dis. Reptr*, 40, 1, pp. 21–25, 1 map, 1956.

Studies on the geographical distribution of the cereal yellow dwarf virus [*R.A.M.*, 35, p. 670] at the Department of Plant Pathology, University of California, Davis, revealed the virus to be widespread on cereal crops in the United States. It is present in most counties in California and has been recorded in eight States (Arizona, Arkansas, Illinois, Maryland, Minnesota, Oregon, Washington, and Wisconsin) of the nine surveyed. The virus has also been identified in Holland.

Chinn (S. H. F.) & Russell (R. C.). **Antagonistic activity of micro-organisms in the control of Barley smuts.**—*Canad. J. agric. Sci.*, 36, 1, pp. 1–7, 1956.

As a possible alternative to the control of seed-borne diseases by antibiotics [*R.A.M.*, 34, p. 447] *in vitro* studies at the Plant Pathology Laboratory, Saskatoon, Saskatchewan, showed that soaking barley seed in broth cultures of *Pseudomonas viscosa* or of a filamentous yeast (A 16) at room temperature for 50 hours, or at 86° F. for 40 hours, effectively controlled covered smut (*Ustilago hordei*). The use of *Bacillus subtilis* or a water soak treatment [33, p. 78] were ineffective. Good control of loose smut (*U. nuda*) was obtained by soaking infected seed in a broth culture of *P. viscosa* or in water at room temperature for 60 hours, and slightly less at 67° for 40 or 86° for 22 hours.

Simons (M. D.). **Physiologic races of crown rust of Oats identified in 1954.**—*Plant Dis. Reptr*, 39, 12, pp. 949–955, 1955.

During the investigation by the United States Department of Agriculture and the Iowa Agricultural Experiment Station, Ames, using the new set of ten differential oat varieties, 29 physiologic races of crown rust (*Puccinia coronata*) [*R.A.M.*, 35, pp. 601, 670, and next abstract] were identified among the North American collections in 1954. Race 202 comprised 30 per cent. of the 901 isolates, followed by races 203 (21 per cent.) and 258 (14). Races 264 and 276, attacking Landhafer, Santa Fe, Trispernia, and Bondovic, were each identified once, for the first time from the United States.

Of the 61 isolates (14 races) from *Rhamnus* spp. (mostly *R. cathartica*), races 202 and 203 accounted for 25 and 23 per cent. of the total, respectively. Only three of the 36 collections from *R. lanceolata* were parasitic on oats.

Simons (M. D.). **An examination of the present status and proposed modifications of the annual crown rust race survey in the United States.**—*Plant Dis. Reptr*, 39, 12, pp. 956–959, 1955.

The author reviews the principal objectives of the annual survey for races of oat crown rust [*Puccinia coronata*: see preceding abstract] in the United States and proposes a number of modifications. For a more accurate assessment of the relative prevalence of specific races over a long period of years the use only of single isolates from collections made on completely susceptible varieties, such as Markton and Richland, is recommended. These isolates could be identified on the new set of ten

differential varieties [loc. cit.]. The establishment of a second, non-permanent set of differential varieties, comprising only selections resistant to common North American races and useful, or potentially so, as sources of resistance, is suggested for the more efficient detection of new and potentially dangerous forms of crown rust. This set would be used for testing all crown rust collections received during a given year. Anyone interested in breeding for resistance could submit new selections for possible inclusion in this set.

Morey (D. D.). **Smut resistance of some southern Oat varieties.**—*Plant Dis. Reptr*, 39, 12, pp. 960–962, 1955.

In varietal evaluation trials against oat smuts (*Ustilago avenae* and *U. kolleri*) [*R.A.M.*, 33, p. 666] at the Coastal Plain Experiment Station, Tifton, Georgia, in 1954 and 1955, using artificially inoculated seed, Seminole and Coker 53–29 developed no infection, while high resistance was shown by Delair and C.I. Nos. 6571, 6717, and 6744 from the Texas–United States Department of Agriculture co-operative breeding experiments. The smut-resistant selections C.I. 6671 from Iowa and C.I. 7098 and C.I. 6909 from Minnesota also possess resistance to stem and crown rusts [*Puccinia graminis* and *P. coronata*]. Resistance to the smuts and to *P. graminis* is combined in 3928–5–4 and 3928–5–8 from Canada.

Hooker (A. L.). **Septoria reactions of entries in the North Central States Uniform Oat Yield Nursery and other strains in 1955.**—*Plant Dis. Reptr*, 39, 12, pp. 963–966, 1955.

Infection of oats by *Leptosphaeria avenaria* [*R.A.M.*, 35, p. 520] in America varies in different years and localities and in some oat breeding nurseries the disease is so sporadic that there is little opportunity to select for resistance. The reactions of numerous oat varieties and new selections developed in the North Central States were therefore studied under conditions of natural infection and artificial inoculation at Madison, Wisconsin, in 1955. Strains C.D. 920, C.D. 1002 (both *Avena brevis*), C.D. 1007, C.D. 3820 (both *A. strigosa*), C.D. 4090, and C.D. 5022 (both *A. sativa*), previously reported as resistant [33, p. 476], showed 22 per cent. or less leaf infection and 7 per cent. or less on the stems following inoculation.

Gröger (D.). **Qualitätszüchtung am Mutterkorn.** [Breeding for quality in ergot.]—*Kulturpflanze* (*Ber. Inst. Kulturpfl Forsch.*), *Suppl.* 1, pp. 226–238, 3 figs., 3 graphs, 1956.

The author discusses the chemical nature and physiological properties of the constituents of the ergot (*Claviceps purpurea*) alkaloid complex [*R.A.M.*, 35, p. 521 and next abstract], and presents in tabular form the total yields and constituents of the complex for a number of strains grown on rye at the Institute for Cultivated Plant Research, Gatersleben, Germany, in 1955. A number of effectively constant strains have been isolated which produce only one or other of the constituents of the complex with, at most, unimportant traces of the others. Spontaneous mutations were seldom found. By ultra-violet irradiation some mutants with white sclerotia producing alkaloid were obtained, indicating that production is not linked with pigmentation.

There is a need for better techniques of inoculation and harvesting.

Niemann (E.). **Möglichkeiten zur Abtrennung von Mutterkorn aus Roggensaatgut.** [Possibilities of the separation of ergot from Rye seed.]—*Angew. Bot.*, 30, 3, pp. 65–72, 1 fig., 6 graphs, 1956.

The author describes attempts at the Kiel–Kitzeberg branch of the German Biological Institute to clean seed rye contaminated with ergot [*Claviceps purpurea*: see preceding abstract] sclerotia of about the same size as the grains. Wind-sifting

by horizontal draught reduced the number of sclerotia by about one-half, with a loss of about 15 per cent. of the grain. Most sclerotia could be removed by flotation in a sodium nitrate solution having a specific gravity of 1·12, but this method does not seem suitable for general practice.

Harrison (D. S.) & Cox (R. S.). **Spraying Sweet Corn for the control of northern Corn leaf blight.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 213–216, 1 diag., 1956.

In a randomized block experiment (six replications) carried out at Everglades Experiment Station, Florida, the efficiency of three nozzle types (Myers Jumbo, Myers Fembro, and T Jet T10) in spraying against *Helminthosporium turcicum* [*R.A.M.*, 35, p. 444] on Golden Security sweet corn was compared. Thirteen applications of nabam plus zinc sulphate (2 qts.–$\frac{3}{4}$ lb.–100 gals.) were made at 45 to 110 and 80 to 180 gals. per acre. The spray equipment used was that previously described [34, p. 736]. Disease severity was scored on a scale of 0 (no disease) to 11 (complete defoliation).

With the Myers Jumbo and the low rate of application disease severity was 2·3 on 28th April, 1955, and 1·3 on 19th May; the yield (24th May) of the upper ear was 32 lb. and that of the lower 18·5. At the high rate of application the corresponding figures were 1·3, 1·1, 31, and 18·4. The figures for the Myers Fembro, low rate, were 2·3, 1·1, 31, and 16·7, and high rate, 1·5, 1·3, 33 and 18·3; for T Jet T 10, low rate, 2·3, 1·3, 31, and 17·5, and high rate, 1·5, 1, 31, and 18·9; and for the untreated 4·7, 3·9, 30, and 9·4.

It is apparent that the three nozzle types performed equally well with respect to both disease severity and yield. There were no significant differences in yields between plots treated at the low levels and those at the high under the prevailing conditions of moderate infection. It seems that the selection of nozzle types should be based on factors other than field performance, such as initial cost and durability. It is also suggested that it would pay growers to make a critical study of the amount of material applied per acre; apparently, there is a point of maximum efficiency in gallonage output under a given set of conditions, any additional material applied being needless waste.

Harvey (P. H.), Thompson (D. L.), & Hebert (T. T.). **Reaction of inbred lines of Corn to brown spot.**—*Plant Dis. Reptr*, 39, 12, pp. 973–976, 1955.

In field inoculation experiments at the North Carolina Experiment Station and Field Crops Research Branch, Raleigh, maize breeding lines from various sources were tested for resistance to brown spot (*Physoderma maydis*) [*R.A.M.*, 33, pp. 217, 533], the development of resistant hybrids being the most practical means of control. Plants 1 to 3 ft. tall were inoculated at 10- to 14-day intervals three times in 1950 and twice in 1951 and 1954. Inoculum was obtained by grinding dried, infected leaves and leaf sheaths from the previous year. Some 100 ml. of this material, containing sporangia, was suspended in 2$\frac{1}{2}$ gals. water, screened to remove the larger fragments, and 5 to 10 ml. were placed in the leaf whorl of each plant with a 2- to 3-gal. sprayer from which the whorl plate of the nozzle had been removed.

The inbreds NC 42 and GT 154 each had a mean rating of 1 (highly resistant) in the scale 1 to 5 (very susceptible); 30 other inbreds tested for at least two years were rated at 2 or less. These lines are regarded as sufficiently resistant for use in a practical breeding programme.

Childs (J. F. L.), Grimm (G. R.), Grant (T. J.), Knorr (L. C.), & Norman (G.). **The incidence of xyloporosis (cachexia) in certain Florida Citrus varieties.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 77–82, 1 fig., 1956.

General field observations on bud union disorders of citrus trees in Florida,

observations on Orlando tangelo test plants in the budwood certification nursery, and studies of parent trees in the Certification Programme demonstrated that the xyloporosis virus [*R.A.M.*, 32, p. 18; 35, p. 603] was present in 30 varieties of citrus not previously reported as harbouring the virus [cf. 33, p. 721]. Of 339 candidate trees in the Budwood Programme, 62 per cent. induced xyloporosis symptoms in 2 to 2½ years when budded on Orlando tangelo. Bud union symptoms suggestive of xyloporosis were not seen on grapefruit trees on rough lemon or on sweet orange or grapefruit on sour orange, though many were infected. The evidence indicates that the xyloporosis virus is present in a majority of the sweet orange trees in Florida.

Wallace (J. M.), Oberholzer (P. C. J.), & Hofmeyer (J. D. J.). **Distribution of viruses of tristeza and other diseases of Citrus in propagative material.**—*Plant Dis. Reptr*, 40, 1, pp. 3–10, 1956.

The authors discuss the origin of the introduction of tristeza virus of citrus into the United States [*R.A.M.*, 33, p. 15; 34, p. 783]. The virus has been found in two different Satsuma selections, propagated in 1914 from budwood obtained from Florida and grown at the California Citrus Experiment Station, and must have been present in Florida prior to 1914 [34, pp. 91, 296]. A Red Ling Mung, a mandarin-lime type of tree, imported from China in 1921, and Meyer lemon trees [35, p. 603] grown in an experimental planting at the University of California, Los Angeles, were both found to be infected while neighbouring trees of sweet orange on sour orange rootstock remained healthy, indicating that little natural infection had occurred and that the diseased trees were already infected when planted.

The authors note the ubiquity of psorosis virus [35, p. 178; C.M.I. map No. 65], of unknown origin, which is generally spread by propagating material, though rare instances of seed transmission are recorded. It has no known vector. In view of these and other virus diseases citrus importations are now made by seed, or with very careful indexing of each introduction to various budded citrus combinations.

Wander (I. W.) & McBride (J. J.). **A chlorosis produced by fluorine on Citrus in Florida.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 23–24, 1 fig., 1956.

In April, 1950, shortly after a phosphate manufacturing plant had been put into operation locally, the leaves of citrus trees in the Bartow area of Polk County, Florida, developed a chlorotic condition. Several more of these factories were built in the vicinity during the next few years, and in 1954 reports of the same type of chlorosis were received from groves over a wide area. Affected leaves contained up to 370 p.p.m. of fluorine [*R.A.M.*, 35, p. 98], normal leaves from outside the area containing only 12 to 30 p.p.m.

In the spring of 1955 fluorine-containing sprays were applied at a concentration of 0·1 N to the foliage of four-year-old Ruby Red grapefruit trees 19 miles from the nearest factory. After seven applications of 1 l. each per tree made during a period of two months a chlorotic pattern identical with that observed on the originally affected trees appeared on the foliage sprayed with hydrofluoric or fluosilicic acid, but not on those receiving phosphoric acid.

In some instances the application of nutritional sprays and chelated iron to the affected groves resulted in an improvement in general appearance, but the chlorotic leaves did not turn green and the pattern on them persisted.

Volcani (Z.). **Erwinia rhapontici pathogenic to Citrus fruits.**—*Bull. Res. Coun. Israel*, 5, 1, pp. 129–130, 2 figs., 1955.

In inoculation experiments at the Agricultural Research Station, Rehovot, a culture of *Erwinia rhapontici* [*R.A.M.*, 31, p. 174] isolated from wilting clover produced lesions on citrus and tomato fruits and cucumber and onion slices, but not on clover.

The common and uncommon diseases and pests of Arabica and Robusta Coffee, their treatments and remedies.—*Indian Coffee*, 19, 3, pp. 62–63; 4, pp. 80–82, 2 figs.; 5, pp. 100–103, 3 figs., 1955.

In this account of coffee diseases by the Research Department of the Indian Coffee Board, Balehonnur, south India, recommendations against leaf disease (*Hemileia vastatrix*) [*R.A.M.*, 35, p. 606] include planting resistant varieties and spraying with 2–2–40 Bordeaux mixture when the new leaf flush is formed in March to April, and again in September to October, additional tip sprays sometimes being necessary. Black rot (*Pellicularia* [*Corticium*] *koleroga*) [34, p. 721] may be controlled by measures to increase light and air and by spraying affected areas with Bordeaux mixture early in the monsoon. Die-back [27, p. 419], the cause of which is still uncertain, may be countered to some extent by Bordeaux spraying, attention to drainage, and the accompaniment of heavy cropping by larger applications of fertilizers. Stump rot or brown root disease (*Fomes noxius*) [31, p. 15] is controlled by removal of diseased bushes and of their neighbours also if inspection shows the roots to be attacked. Replanting should be deferred for two seasons. Any shade or jungle trees to be felled should be ringed first and a tree killer applied. The same measures are effective against *Rosellinia arcuata*. Damping-off of seedlings by *Rhizoctonia* or *Fusarium*, which may cause 15 to 30 per cent. loss, is avoided by reduction of shade and attention to drainage, burning infected plants, loosening the soil, and drenching the seedlings and soil with 2–2–40 Bordeaux mixture every four days for a week or two.

Of the less important diseases, brown eye spot (*Cercospora* [? *coffeicola*]) may be controlled by attention to shade, drainage, and spraying if it becomes serious. Pink disease (*Corticium salmonicolor*) is not common on coffee in south India. Diseased limbs should be removed and Bordeaux mixture used if necessary.

Meiffren (M.). **La trachéomycose du Caféier en Côte d'Ivoire.** [Tracheomycosis of the Coffee bush in the Ivory Coast.]—*Bull. Cent. Rech. agron., Bingerville*, 11, pp. 49–63, 1 fig., 1 graph, 1955.

Most of the information in this paper on tracheomycosis of coffee caused by *Fusarium* [*Gibberella*] *xylarioides* [*R.A.M.*, 35, p. 522] in the French Ivory Coast has already been noticed from another source [35, p. 449]. A method for developing a resistant population by grafting to resistant varieties is outlined.

McIlrath (W. J.). **Cotton stem intumescences as a result of flooding.**—*Plant Dis. Reptr*, 40, 1, pp. 65–67, 2 figs., 1956.

Investigations at the Department of Botany, University of Chicago, Illinois, showed that abnormal stem metabolism after flooding was responsible for cotton stem intumescences noted by Chester [*R.A.M.*, 22, p. 321] and observed a few years previously at the Texas Agricultural Experiment Station, and that it was induced by the surrounding water, rather than excess of water in the plant. Exposure to low or high light intensity or to 100 per cent. relative humidity (reported as the cause of intumescences in other plants) did not cause the abnormality, but it was produced when portions of the stem alone were flooded (by means of sealed glass tubes), and the effect was partially reproduced by coating the stem with lanolin.

Reinking (O. A.). **Evaluation of Abaca industry in the Philippines in relation to mosaic disease and a program for rehabilitation.**—Agriculture Division, United States Operations Mission to the Philippines, Manila, 59 pp., 1 map, 1955. [Mimeographed.]

This report sets out the practical application to various areas of the Philippines of the programme for the control of mosaic virus disease [? strain of cucumber

mosaic virus] of abaca [*Musa textilis*: *R.A.M.*, 35, p. 610]. The presence or absence of the disease in all the plantings has been mapped out. It has been reported in Albay and Sorsogon of the Bicol region, which is otherwise mosaic-free. [Abaca] bunchy top is present in Albay.

Areas are classified according to the estimated 'life' of the plantations. It is recommended that control should be intensified, but only in those with at least five to ten years' 'life' (15 per cent. infestation). Total fibre production was expected to be lower in 1955. Two new areas have been zoned for future cultivation and all other places scheduled will be in virgin forest.

GOIDÀNICH (G.). **Malattie crittogamiche della Canapa.** [Cryptogamic diseases of Hemp.] 21 pp., 10 figs., Associazione Produttore Canapa, Bologna-Napoli, [? 1955. Received March, 1956.]

Brief notes are given in semi-popular terms on the causes, symptoms, and control of the following diseases of hemp in Italy [*R.A.M.*, 15, p. 97]: the leaf spots caused by *Didymella arcuata* [19, p. 280], *Phyllosticta cannabis* [loc. cit.], *Septoria cannabis* [cf. 16, p. 749], and *Pseudoperonospora cannabina* [31, p. 184]; the stem diseases due to *Botryosphaeria marconii* [25, p. 493], *Sclerotinia sclerotiorum*, *Botrytis* sp., *Pseudomonas mori* [31, p. 184], and *Macrophomina phaseoli* [cf. 19, p. 254]; pre- and post-emergence damping-off [cf. 23, p. 63], the cause of which has not yet been ascertained; and streak virus. In this latter disease a chlorosis develops at the leaf apices along lines running from the bases of the main veins, the entire leaf becoming striped and curling up. Later, brown spots surrounded by a pale green halo appear and the tissues develop lacerations. Affected plants are small, the stems are weak, and the production of fibre and seeds is much reduced; the quality of the fibre, however, is not affected. The chief vector is *Phorodon cannabis*. A similar virus disease has been reported on hemp from the United States, Germany, and Czechoslovakia [30, p. 107].

WESTGATE (P. J.) & MILLER (H. N.). **Molybdenum deficiency of Hibiscus.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 335–338, 5 figs., 1956.

In experiments conducted mainly at the Central Florida Experiment Station, Sandford, and the Agricultural Experiment Station, Gainesville, strap-leaf of *Hibiscus*, a disorder found on acid soils from Pensacola to Miami and from Tampa to Daytona and characterized by dark green, strap-like leaves and deformed flowers with few or no petals, was corrected by the use of 5 gm. of molybdic acid or sodium molybdate in one gal. of water per plant, applied as both a foliar spray and soil drench. The addition of lime to the soil at the rate of 1 lb. per plant prolonged the corrective effect of the molybdenum.

MILLER (H. N.). **Investigations with antibiotics for control of bacterial diseases of foliage plants.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 354–358, 1956.

In experiments conducted at the Florida Agricultural Experiment Station, Gainesville, on the control of [unspecified] bacterial leaf and stem rot of *Philodendron* by antibiotics, most of the work was done in the greenhouse on artificially inoculated plants maintained under controlled conditions, infection being more uniform and severe than that occurring naturally in commercial nurseries. The plants used were mainly *P. wendlandi* × *P. lacineatum*. To check the possible phytotoxicity of the antibiotics, greenhouse-grown plants of several species of *Philodendron* were sprayed with the products four times at five-day intervals; no injury occurred to any plant treated at concentrations up to 600 p.p.m. To determine the effectiveness of the antibiotics as eradicant sprays, plants were sprayed at intervals of 0, 12, and 24 hours after inoculation, with the antibiotics at concentrations of 200 and 400 p.p.m.

In general the antibiotics gave more effective control when applied prior to infection than when used as eradicant sprays. Agrimycin (15 per cent. streptomycin and 1·5 per cent. terramycin) at 200 p.p.m., applied 48 hours before infection, completely prevented symptom development. Phytomycin (20 per cent. streptomycin nitrate) at 400 p.p.m. was almost equally effective. One application of agrimycin at 400 p.p.m., after symptoms had occurred, arrested further development of the disease. On naturally infected plants agrimycin at 200 p.p.m., repeated at 4-day intervals, gave the most effective control. Applied as soil drenches the antibiotics failed to prevent or arrest infection.

Moreau (Mireille). **Réaction de défense de l'Œillet aux attaques de champignons parasites et analogie avec l'action de dérivés chlorés du crésol.** [Defence reaction of the Carnation to the attacks of parasitic fungi and analogy with the action of chlorinated derivatives of cresol.]—*C. R. Acad. Sci., Paris*, 242, 24, pp. 2855–2857, 1956.

The results of experiments in which 35,000 carnation plants of a highly susceptible variety were sprayed with 0·5 per cent. dichloro-m-*p*-cresoxypenta-ethylene glycol against *Phialophora* [*Verticillium*] *cinerescens* [cf. *R.A.M.*, 30, pp. 217, 369] demonstrated the existence of an analogy between the action of the fungicide and the natural defence reactions operating in resistant varieties, e.g., rapid occlusion of the infected vessels and stimulation of the reproductive functions.

Glasscock (H. H.). **Testing for the Carnation wilts.**—*J. R. hort. Soc.*, 81, 7, pp. 313–316, 1 fig. (between pp. 310–311), 1956.

In a general note on wilts of various origin in carnation the author describes a modification of the method of Hellmers [*R.A.M.*, 34, p. 524], by which growers may test cuttings for bacterial and fungal infection.

The base of a cutting is stripped of two or three pairs of leaves, cut off with a flamed scalpel and dropped into a solution of sodium hypochlorite (1·5 per cent. free chlorine) for five to 20 minutes. It is then dried on filter paper and four consecutive slices about $\frac{1}{32}$ in. thick are removed and sown on a potato dextrose agar slope. Absence of bacterial and fungal growth after ten days is taken to indicate that the cutting is healthy. The cuttings may be stored in a refrigerator at 31° F. until the results of the test are known.

As a hygienic measure it is recommended that mother plants should be maintained in a separate house and grown in separate pots in sterilized soil, transmission of infection from root to root being avoided by keeping the pots on a hard surface. When a plant proves to be infected it can be removed with its pot, and spread of infection is unlikely.

Pseudomonas caryophylli [35, p. 180] is apparently not yet established in Great Britain, the bacterial wilt recently recorded being caused by a species of *Erwinia*.

Mather (J. C.). **Trials on soil transmission of Tobacco necrosis viruses in Tulips.**—*Plant Path.*, 4, 3, pp. 96–97, 1955.

In 1949–50, at Spalding, Lincolnshire, an almost total failure of Zimmerman tulips forced under glass was caused by tobacco necrosis viruses [*R.A.M.*, 33, p. 725]. To investigate the possibility of infection from the old boxing soil transmission tests were conducted in the nursery.

In 1950–51 infected Zimmerman bulbs from the boxes that had failed and healthy bulbs from another source were each boxed in duplicate in (*a*) soil from the boxes in which the diseased plants had grown; (*b*) the same, steam-sterilized; and (*c*) clean soil in which tulips had not been grown before. All the healthy bulbs gave rise to healthy plants and the infected to diseased.

In the next year healthy bulbs of the very susceptible Korneforos variety

remained healthy in clean soil, but some disease occurred in infested soil. In a similar experiment in 1952 3 to test the effect of potatoes on the infectivity of the soil half of the boxes of infested soil used in 1951–2 were planted in the summer of 1952 with potatoes and the other half left fallow, the clean soil being treated similarly. This time no virus symptoms appeared on Korneforos at all.

During the trials there was little apparent transfer of the virus from soil to bulbs but this may be accounted for by Kassanis's finding [loc. cit.] that tulips do not exhibit disease symptoms until the season following the one in which they pick up the virus. The perpetuation of the disease by infected stock is, however, unquestionable, and once a stock of tulips has shown that the viruses are present in some of the bulbs the whole should be regarded as suspect.

Magie (R. O.). **Recent advances in controlling diseases of Gladiolus.**—*Proc. Fla. hort. Soc.*, 68 (*1955*), pp. 373–376, 1 fig., 1956.

Further studies at the Gulf Coast Experiment Station, Bradenton, Florida, on *Stromatinia* root rot of gladiolus [*Sclerotinia gladioli*: *R.A.M.*, 35, p. 512] showed that the disease was economically important only on well-drained land. Plantings made early or late escaped the effects of the disease almost completely, but the production of sclerotia in the soil usually occurred whatever the time the corms were planted. Fungicidal treatment of the soil made it possible to produce flowers in heavily infested land. In one test root rot was largely controlled when terraclor [pentachloronitrobenzene] was broadcast at the rate of 200 lb. per acre and disked 6 in. deep 75 days before planting. Crag 974 (tetra-hydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione) and vapam [35, p. 31] were also effective. In lightly infested soils applications of 50 to 100 lb. per acre of these materials were moderately effective.

Woltz (S. S.). **Boron nutrition of Gladiolus.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 358–362, 1956.

Analysis of plant samples collected in 1954 from commercial plantings of gladiolus varieties in various parts of Florida at the Gulf Coast Experiment Station showed that the boron contents [cf. *R.A.M.*, 31, p. 490; 34, p. 788] were apparently adequate and not excessive. Samples selected because symptoms of boron deficiency were present had only about 10 p.p.m. of boron in recently developed leaves. The results of greenhouse sand culture experiments indicated that 10 to 15 p.p.m. of boron in recently matured leaves is likely to represent a deficiency level. Increasing the level of potassium in the substrate appeared to increase the boron content of the lower leaves.

Gerlach (W.). **Beiträge zur Kenntnis der Gattung Cylindrocarpon Wr. I. Cylindrocarpon radicicola Wr. als Krankheitserreger an Alpenveilchen.** [Contributions to the knowledge of the genus *Cylindrocarpon* Wr. I. *Cylindrocarpon radicicola* Wr. as a pathogen of Cyclamen.] —*Phytopath. Z.*, 26, 2, pp. 161–170, 7 figs., 1956.

During the last two years *Cylindrocarpon radicicola* has been isolated from 14 specimens of cyclamen [*R.A.M.*, 14, p. 585] submitted to the Biological Institute, Berlin Dahlem, mostly under suspicion of infection by *Fusarium oxysporum* f. *cyclaminis* [34, p. 152], from various regions of north Germany and in one case from Sweden.

The fungus occurs primarily on young plants during the winter and early spring, the optimum temperature for its growth being 22° C. The first symptoms at or just above the base of the petiole are pale yellowish-brown, sunken, mostly oblong spots, later turning darker; they may be either sharply delimited or gradually merging into the surrounding tissue, inducing a diffuse discoloration. Under

favourable conditions the lesions expand so rapidly that the petioles are shrivelled and girdled within a few days, collapsing and drooping with the yellowing, dying leaves. Once the fungus reaches the heart of the corm the whole plant perishes by degrees. Typical symptoms develop on the corms in the form of brown, slightly depressed, mostly circular spots, which at an advanced stage of infection may involve large areas on one side or girdle the corm, extending right down to the base. Internally there are shallow, sharply delimited, dark brown, dry, necrotic foci. The root system often dies off when the corm is severely attacked, remaining behind in the soil when the plants are lifted. Although *C. radicicola* is primarily a parasite of young plants, its importance on older ones should not be underestimated. The pedicels are attacked in the same way as the petioles, while the leaf and corm symptoms are also similar to those on younger plants. Vigorous specimens, several years old, of *Cyclamen africanum* and *C. neapolitanum* have gradually succumbed to infection by *Cylindrocarpon radicicola*.

Typical symptoms of the wilt developed on injured and intact plants inoculated either by immersion in a conidial suspension of the fungus or planting in artificially infested soil. Under natural conditions in nurseries contaminated soil is thought to be undoubtedly the principal source of infection, the fungus being very probably capable of existing as a saprophyte and maintaining itself for lengthy periods in a resting state by means of its thick-walled chlamydospores. It has been shown in California to persist and multiply in old citrus orchard soil even after intensive treatment with steam or fungicides [29, p. 558].

The morphological characters of *C. radicicola*, which was readily isolated from diseased tissue on rice mash or wort and oatmeal agars, are very variable. It forms golden-brown, later sepia to dark brown colonies, exhaling on wort agar an odour of scented soap, which is, however, rapidly lost in culture. The mean and extreme measurements of the mostly cylindrical to somewhat ellipsoid, straight or slightly curved conidia of the cyclamen isolates agreed satisfactorily with those of Wollenweber's diagnosis (*Z. Parasitenk.*, 1, pp. 138–173, 1929), ranging from 4 to 24 by 2 to 5·2 (mean 9·4 by 3·5) μ for the continuous to 38 to 48 by 6·2 to 7 (41·4 by 6·5) μ for the quadriseptate. The uni- to multicellular, intercalary or terminal, mostly round, golden-brown chlamydospores, developing both in the mycelium and conidia, measure between 8 to 13 by 8 to 12 (10·5 by 10) and 36 to 43 by 12 to 15 (40 by 14) μ.

Stahl (Marianne). **Cylindrocarpon radicicola als Krankheitserreger bei Cyclamen.** [*Cylindrocarpon radicicola* as a pathogen of Cyclamen.] —*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 7, pp. 102–105, 9 figs., 1956.

The author gives an account of *Cylindrocarpon radicicola* and the symptoms of infection in cyclamen, already noticed from another source [see preceding abstract]. She considers that control may be achieved either by steaming or chemically treating the soil, but experience over several years with both methods in a Stuttgart nursery has indicated the superiority of treatment with chloropicrin, though the steaming may not have been sufficiently thorough. Germination tests of cyclamen seed on agar indicated that seed infection with *C. radicicola* is very rare.

Domsch (K. H.). **Beitrag zur Beizmittelprüfung an Samen von Zierpflanzen.** [Contribution on treatment tests with seeds of ornamental plants.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 5, pp. 69–72, 1 graph, 1956.

Some of this information from the Biological Institute, Kiel-Kitzeberg, Germany, on the germinability of China aster seed infected by *Botrytis cinerea* has been noticed from another source [*R.A.M.*, 35, p. 455]. Sand or filter paper was suitable for comparisons between fungicides, but soil sowings were necessary for their final evaluation. Tests showed that healthy seed of antirrhinum, *Aquilegia*, wallflower,

Delphinium, *Godetia*, *Iberis*, poppy, and *Verbena* is not adversely affected by ceresan at levels of up to 10 mg. per kg.

Hollings (M.). **Physiological ring pattern in some Gesneraceae.**—*Plant Path.* 4, 4, pp. 123–128, 1 pl., 1955.

Investigations conducted at the Plant Pathology Laboratory, Harpenden, on ring and line patterns on the leaves of some Gesneraceae are described. On *Saintpaulia* [cf. *R.A.M.*, 34, p. 597] spp. the markings appeared as coarse yellow or brownish ring and line patterns on the upper surface, or large yellow areas, becoming brown and leathery, with collapse of the tissues. On gloxinia the patterns were greener, and on *Gesnera* a bright rusty red. *Achimenes* leaves often had only necrotic brown flecks, with some leaf buckling, but ring and line patterns may develop.

All attempts to transmit the symptoms failed, but further experiments, in which *Saintpaulia* plants were watered from above and below in summer and winter, exposed to shade and sunlight while being watered, watered from above with warmed and chilled water, and exposed to dry chilling and artificial irradiation, clearly demonstrated that the symptoms are due to sudden chilling of the leaves in sunlight. The injury sustained appeared to be cumulative. Only slight markings resulted from chilling in moderate shade and none from chilling in heavier shade. No exact figures can be given for the threshold of light intensity required to induce susceptibility, but no markings developed where the incident light did not exceed 30 foot-candles, though at 2,000 foot-candles the plants were highly susceptible. A minimum temperature of about 18° C. appeared to be necessary before the plants became susceptible, and this probably explains the reduction of susceptibility during winter. More is involved, however, than a sudden temperature change. In sunlight and above a certain minimum temperature a condition of susceptibility begins in a little under half an hour, reaching a maximum after one hour; this is maintained while the plants are exposed to full sunlight, but declines steadily in shade. In view of this, and since the chloroplasts are the focus of the damage, it appears that sudden chilling when the plants are susceptible disorganizes some stage in the photosynthetic process. Affected plants should be watered from below, and wherever possible the Gesneraceae should be kept away from direct sunlight.

Henderson (D. M.). **Cystopus candidus on Aubrietia.**—*Plant Path.*, 4, 3, p. 110, 1955.

In June, 1954, *Aubrieta* plants in St. Andrew's Botanic Garden [Scotland], were attacked by *Cystopus candidus* [cf. *R.A.M.*, 32, p. 81]. At about the same time infected plants were also observed at Blairgowrie, Perthshire, and shortly afterwards others were found in East Lothian and at the Royal Botanic Garden, Edinburgh, where infection had been noted in 1953. The effects appeared to be mild, except in very dry conditions, when the sepals and petals were attacked and either the flowers fail to open or the colour of the expanded petals was 'broken'. Inoculations with sporangia from *Aubrieta* to *Aubrieta*, *Alyssum saxatile*, and cauliflower gave infection of *Aubrieta* only.

Sleeth (B.). **Crown necrosis of Bells of Ireland.**—*Plant Dis. Reptr.*, 40, 1, p. 80, 1956.

A species of *Myrothecium* is reported to be responsible for crown necrosis of *Molucella laevis* which is grown commercially in the Lower Rio Grande Valley, Texas. The disease, characterized by necrotic lesions encircling the plant at or near the ground level and extending a short distance (less than 1 in.) up the stem or down into the tap root, caused considerable losses to growers in 1953 and 1954. The affected plants usually wilt rapidly and die, or the stem may be partly girdled and one or two basal branches girdled and killed.

Sporodochia 0·5 to 2 mm. in diameter appear on the lesions; the conidia are single celled, hyaline, oblong, and approximately $6 \times 3\,\mu$.

Fischer (R.). **Ein neuartiges Mehltauauftreten an Goldregen.** [A new mildew on Golden Rain.]—*PflSchBer.*, 16, 10–12, pp. 173–188, 9 figs., 1 graph, 1956. [English summary.]

The author reports a powdery mildew on *Laburnum anagyroides* found in a Vienna garden in 1946 [cf. *R.A.M.*, 33, p. 523]. The fungus overwinters in the buds, which are late in opening. Frequently the shoots are not uniformly affected and the leaves may be normal or stunted in varying degree. Flower development is often inhibited. From mid-July conidial infection occurs only on the immature leaves, which become dented or curled. In the absence of the perfect state the author has named the fungus *Oidium laburni* [? n.sp., without a Latin diagnosis: cf. *Microsphaera guarinonii*].

Turf diseases.—*Sports Turf Bull.* 34, pp. 3–9, 3 figs., 1956.

Most of the information in this bulletin on the major diseases of turf grasses in Great Britain has already been noticed [*R.A.M.*, 35, pp. 611, 679]. Outbreaks of *Fusarium* patch [*Calonectria graminicola*: 35, p. 681] occurred during the autumn and winter of 1955 and the spring of 1956. One experiment begun during the summer of 1955 demonstrated that the amount of nitrogenous fertilizer applied to turf in July, August, and September influenced the amount of this disease which occurred late in winter. Incidence was 31·5 per cent. on 20th March on plots receiving 1 oz. ammonium sulphate per sq. yd. on 8th July, 8th August, and 6th September, whereas no disease occurred on the untreated plots. In another experiment a griseofulvin suspension was applied two days before inoculation at 220, 440, or 880 μg. per ml. to New Zealand brown top [*Agrostis tenuis*] rendered susceptible to patch by two applications of ammonium sulphate at 1 oz. per sq. yd. separated by a monthly interval before inoculation. Concentrations above 220 μg. per ml. significantly reduced the amount of disease, there being 16·25 and 7·5 per cent. area affected on 25th July on the plots receiving 440 μg. and 880 μg., respectively, as compared with 36·25 per cent. the untreated plots. It is emphasized that the test conditions were far more severe than would be encountered in practice.

Govinda Rao (P.) & Reddy (G. S.). **Two new records of Ephelis on grass hosts.**—*Sci. & Cult.*, 21, 11, pp. 669–671, 2 figs., 1956.

From the Agricultural College, Bapatla, India, the authors report that *Ephelis* (?) *oryzae* [*R.A.M.*, 32, p. 211] was present in abundance on *Pennisetum hohenakeri* and *Digitaria marginata* in September, 1954, near the Araku Valley in the State of Andrha. Rice in the vicinity was heavily infected by *E. oryzae* during the season.

Ekstrand (H.). **Overvintringen av höstsädda grödor och vallar vintern 1954–55.** [Overwintering of autumn-sown crops and forage grasses in the winter of 1954–55.]—*Växtskyddsnotiser, Stockh.*, *1956*, 1–2, pp. 1–7, 3 figs., 1956.

This is a report on the usual lines [cf. *R.A.M.*, 35, p. 191] of the local importance and relative distribution in different parts of Sweden of snow mould (*Fusarium*) [*Calonectria nivalis*], *Typhula borealis*, *T. itoana*, and *Sclerotinia borealis* on cereals and forage grasses, and of *S. trifoliorum* on clover. It was observed in the course of fertilizing experiments that combined applications of phosphorus (as superphosphate or basic slag) and lime reduced the incidence of *S. borealis*.

Quantz (L.). **Die Rosettenkrankheit, eine Viruskrankheit der Serradella (Ornithopus sativus L.).** [Rosette disease, a virus disease of Serradella (*Ornithopus sativus* L.).]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 2, pp. 17–20, 5 figs., 1956.

The author describes a virus disease of *Ornithopus sativus* characterized by a

rosette-like shortening and curling at the tips of the growing shoots, mild mosaic, and early yellowing of the leaves. The virus was transmissible in expressed sap to peas, beans (*Vicia faba* var. *minor* and *Phaseolus vulgaris*), sweet pea, white and yellow lupins, clover (*Trifolium hybridum* and *T. incarnatum*), and *Chenopodium quinoa*. The aphid *Myzus persicae* transmitted infection from pea to *O. sativus*.

The virus was inactivated after ten minutes at a temperature of 60° to 65° C. and the dilution end point for expressed sap lay between 1 in 1,000 and 1 in 2,000. It remained active for 24 hours *in vitro*. In exudates from the vascular bundles of infected pea plants the particles appeared as slightly bent threads of average length 750 mμ. The particle size [*R.A.M.*, 35, p. 260] and the host range lead the author to place it under bean yellow mosaic virus [35, p. 260], though in *P. vulgaris* it is less virulent than the type virus.

Control would appear to be necessary only in nurseries, where *O. sativus* should be planted early and kept apart from such known winter hosts of the virus as gladiolus and clover.

Fernandez Valiela (M. V.), Bakarcic (M.), & Turica (A.). **Manual de enfermedades y plagas de los frutales y forestales en el Delta del Paraná.** [Manual of fruit and forest tree diseases and pests in the Delta of Paraná.]—*Publ. misc. Minist. Agric., B. Aires*, 400, 192 pp., 44 pl., 11 figs., 1954.

Some of the records in the authors' valuable survey of the existing position in regard to fruit and forest tree diseases and their control in Argentina have already been noticed in this *Review*. Among many other items of interest the following may be mentioned. *Taphrina pruni* causes sporadic damage to plum [*R.A.M.*, 3, p. 260], especially the Abundancia variety, Reine Claude being resistant. *Septobasidium saccardinum*, a symbiont of cochineal insects [*Coccus cacti*: cf. 19, p. 91], is common on this host in neglected orchards. *Sclerotinia fructicola* [C.M.I. map No. 50] is of infrequent occurrence on plums and unimportant on apples but highly destructive to peaches, especially in the form of a rapid and complete fruit rot. Peaches are also more susceptible than plums to crown gall (*Bacterium* [*Agrobacterium*] *tumefaciens*). Three serious new diseases of plum recently reported [*R.A.M.*, 35, p. 617] are briefly described.

During the period between 1935 and 1950 the tristeza virus [33, p. 535; C.M.I. map No. 289] was responsible for a crisis in the citrus industry, especially in the provinces of Entre Ríos, Corrientes, Misiones, and Salta and Jujuy. It is estimated that over 10,000,000 trees in full bearing grafted on sour orange stocks died from the disease. In the Delta the damage was less severe, and at present tristeza, though ubiquitous in all varieties on every kind of stock, occurs exclusively in a latent form. The trifoliate orange [*Poncirus trifoliata*], sweet orange, and mandarin are all tolerant of tristeza and well adapted for local use as stocks. All species of citrus grafted on *P. trifoliata* have developed exocortis [No. 291; *R.A.M.*, 35, p. 180], which is widespread in the Delta, with a relatively high incidence of over 5 per cent. The agent of the disease, presumed to be a virus, has a lengthy incubation period, no symptoms having appeared by June, 1953, in trees budded with infected material in 1949.

Severe attacks of leaf curl (*Taphrina deformans*) [C.M.I. map No. 192] on peaches, such as developed in 1952, cause appreciable reductions of quality and yield. The species of *Phomopsis* causing necrosis [*R.A.M.*, 23, p. 307] followed by death of the current year's growth was shown to be the imperfect state of *Diaporthe eres* [? identical with the European *D. perniciosa*: 25, p. 372]. The disease is known colloquially as 'prickle' and the minute lesions produced by the fungus form channels of entry for other pathogens. Heavy infection of peaches by *Oidium leucoconium* [*Sphaerotheca pannosa*] var. *persicae* causes foliar malformation and destruction of the shoots. Various weakly parasitic fungi probably contribute to a twig blight causing

severe damage on unthrifty trees, the species chiefly concerned under local conditions being *Rhabdospora persiciphila*. *Phytophthora cinnamomi*, determined for the first time in the Delta Phytopathological Laboratory as an agent of peach gummosis [cf. 28, p. 210], is not widely distributed but may be responsible for the death of trees invaded through wounds.

The local cultivation of certain apple varieties is impracticable on account of susceptibility to bitter rot (*Glomerella cingulata*), which is particularly injurious to Yellow Newton Pippin and Jonathan. Less susceptible are Delicious, Rome Beauty, and Stayman Winesap, while Winesap is resistant. The fungus also attacks quinces. The important and widespread causal organism of apple black rot, *Physalospora obtusa*, occurs in Argentina exclusively in the imperfect state. The Cara Sucia, Blanquita, Jonathan, Winter Banana, Newtown Pippin, Delicious, and Granny Smith varieties are very susceptible. Quinces again are also liable to infection. Apple scab (*Venturia inaequalis*) [No. 120] is of major economic significance as a source of fruit depreciation on susceptible varieties, such as Delicious, Granny Smith, Newtown and Canada Pippins, Cara Sucia, Winter Banana, and Stayman Winesap; Jonathan, King David, and Favorite are more resistant. Powdery mildew (*Podosphaera leucotricha*) [No. 118], developing only in the *Oidium* state, causes such heavy damage on Jonathan that local cultivation of this variety has been largely discontinued. Less susceptible are Rome Beauty, Glengyle Red, Gravenstein, Yellow Newtown, and Stayman, while Winesap and Delicious are resistant. *Coniothecium chomatosporum*, the agent of an important disease known as blister canker on apple [cf. *R.A.M.*, 32, p. 568] and also attacking pear in a milder form, has only been recognized in America of recent years. Susceptible varieties are Newtown Pippin, King David, Delicious, Jonathan, and Granny Smith. The apple canker caused by *Nectria galligena* [C.M.I. map No. 38] is of no importance in the Delta. Sooty blotch (*Gloeodes pomigena*) and fly speck (*Leptothyrium pomi*), though purely superficial, reduce the commercial value of apple fruits. *Elsinoe piri*, occurring on apple and pear only in the *Sphaceloma* state, is quite unimportant locally, as also is apple mosaic virus. Baldwin, Stayman, Winesap, Delicious, and other apple varieties are susceptible to bitter pit, responsible for sporadic damage to ripe or stored fruits which depreciates their market value.

Fabraea maculata, known in Argentina only in the imperfect state, is a limiting factor in quince cultivation [cf. 35, p. 692], causing premature defoliation and spotting and malformation of the fruits.

Scab (*V. pirina*) is the principal disease of pears in the Delta, causing heavy reductions of yield and marketability. The effects of *Sclerotinia fructicola* on pear are similar to those already indicated for peach.

Only edible varieties of vines are grown in the Delta. The prevailing humid conditions favour the development of *Plasmopara viticola* [No. 221; *R.A.M.*, 33, p. 137]. Anthracnose (*Elsinoe ampelina*) [C.M.I. map No. 234], occurring in the imperfect state, is rare and causes negligible damage.

Mycosphaerella populorum [cf. *R.A.M.*, 35, p. 646] is highly pathogenic to the A[rnaldo] M[ussolini] poplar hybrid [23, p. 365] and has wiped out *Populus laurifolia* and the hybrids Rochester, Oxford, Rosbury, and A[lemán] No. 7. The Carolina and 'native' poplars and hybrids 488 and 214 are more or less resistant. So devastating were the outbreaks of poplar rust (*Melampsora laricipopulina*) [17, p. 83] in 1935-6 that the after-effects were felt for many years, but of late the virulence of the fungus has declined. The disease was the principal cause of the deterioration of the 'native' poplar, which has made very little progress towards recovery, whereas the Carolina has recuperated from similar attacks by *M. albertensis* and is now in good condition. Arnaldo Mussolini is slightly susceptible to both species. Notes are given on two other diseases of poplar,

namely, anthracnose (*Sphaceloma populi*) [23, p. 462] and leaf spot (*Mycosphaerella populi*) [23, p. 366].

Not only does *Phytophthora cinnamomi* cause a canker of planes [*Platanus* spp.] which largely precludes their cultivation in the Delta [31, p. 152; 33, p. 433], but it also attacks *Casuarina* trees, mostly those of two to five years old, which are used as a protection against coastal erosion as well as for shelter on mountains and in nurseries. Of minor importance on *Platanus* is anthracnose (*Gnomonia veneta*) [*G. platani*: cf. 30, p. 393].

The local cultivation of pine (*Pinus insignis*) has also become a total loss through the canker due to *Phytophthora cinnamomi* [30, p. 433], from which *Pinus caribaea*, however, has remained immune in adjacent plantings. Serious losses in pine and *Eucalyptus* nurseries are caused by damping-off (*Phytophthora*, *Fusarium*, *Rhizoctonia*, *Pythium*, and other spp.). Other diseases of *Eucalyptus* are a chestnut-coloured leaf spot (*Cercospora epicoccoides*) and crown gall (*Agrobacterium tumefaciens*), which causes 100 per cent. infection on *E. rostrata* but does not affect *E. saligna* at all.

American and European oaks, mostly in young plantings, sustain damage from mildew (*Microsphaera quercina*). Willows [*Salix* spp.], cultivated on a very small scale, thrive in the Delta, the only fungal pathogen listed being *Sphaceloma murrayae* [24, p. 166], causing an unimportant leaf scab [but see 33, p. 455].

Second symposium on virus diseases of fruit trees in Europe, August 23–27, 1955, Wageningen, Netherlands.—*Tijdschr. PlZiekt.*, 62, 2, pp. 33–88, 23 figs., 1 map, 1956.

After an opening address by J. G. Ten Houten (pp. 37–39) concerned with the present status of various fruit virus problems [cf. *R.A.M.*, 35, p. 374], the first paper (pp. 39–42) entitled 'Unusual features of some New Zealand fruit tree viruses' [35, p. 82], was contributed by J. D. Atkinson, describing green crinkle [31, p. 612] and ring spot [33, p. 731] of apples.

H. R. Kristensen's investigations (pp. 42–46) on flat limb virus of apples in Denmark have already been noticed from another source [35, p. 103].

W. Van Katwijk summarizes (pp. 46–49) the available information on rough skin virus of apples in Holland [34, p. 728].

The leaf roll virus disease of sweet cherry in England was briefly described (pp. 49–50) by A. F. Posnette [35, p. 305].

The symptoms and economic importance of the Stecklenberg disease [? a strain of necrotic ring spot] of sour cherries in central Germany [see below, p. 779] were given [in German] (pp. 51–55) by Gisela Baumann.

Summing up the results [in French with an English summary] (pp. 56–59) of recent investigations on plum pox in Yugoslavia, where it is estimated that more than 11,000,000 trees are affected [35, p. 199], M. Yossifovitch emphasized the importance of the mode of propagation (almost entirely by means of suckers) in relation to control. It should be quite practicable to combat the disease by the exclusive use of healthy planting material, the progressive eradication of infected trees, and the establishment of new orchards.

Recent observations on the decline (also known as 'apoplexy') of the apricot in France [30, p. 522] were described [in French with an English summary] (pp. 59–64) by G. Morvan, J. Souty, and R. Bernhard. Experiments on transmission by grafting are still in progress, but the results already obtained suggest that a virus-complex may be responsible for the die-back [cf. 34, p. 604].

Further important information was supplied (pp. 64–67) by G. Scaramuzzi on almond mosaic virus in Apulia, Italy [34, p. 792; 35, p. 658], 11 types of symptoms being described. In 1953 the only symptoms on some five-year-old trees of the Catuccia, Fragiulio, and Rachele varieties were chlorotic blotches followed by

necrosis on the leaves, which were often of abnormal shape. In 1954 the same symptoms appeared in the early spring, intermingled later in the season with line patterns, while in 1955 only the latter developed. In 1953 grafting experiments were performed on apricot, plum, sweet cherry, and peach with material from almond trees showing mixed chlorotic and line-pattern symptoms. By the next year the apricots had developed line pattern and some ring spots (another symptom of the almond virosis, reminiscent of peach mosaic virus [30, p. 375]), the plums had line pattern or yellow-brown mottling, and the peaches line pattern and irregular mottling; the sweet cherry grafts failed to 'take'. The incubation period seems to range from six to seven months, and by the end of two years all the branches of five-year-old plants are involved. All the symptoms tend to disappear with rising temperatures and are imperceptible during August. Most of the diseased trees are simultaneously infested by *Monosteira unicostata*, a probable vector of the virus.

The present aspect of fruit tree virus diseases in Switzerland was reviewed (pp. 67–69) by S. Blumer, with specific reference to flat limb [35, p. 683], proliferation [or witches' broom; 34, p. 230], and rough skin of apple, Pfeffinger disease of sweet cherry, and prune [plum] dwarf on the Italian Prune (Fellenberg) variety [35, p. 106].

R. Ciferri reported (pp. 69–72) recent progress in fruit tree virus research in Italy, particularly on witches' broom of apple [35, pp. 103, 374], which has been transmitted experimentally to apple and to pear, flat limb, mosaic, and rubbery wood (the last a doubtful record from Tuscany).

The only economically important virosis of peach is willow leaf rosette [34, p. 792], which is localized in Liguria. Peach wart [33, p. 734] and mosaic (mentioned above in connexion with almond mosaic) have also been observed, the former in Piedmont and possibly in Veneto and the latter in Emilia.

A few Shiro plum trees in Tuscany show symptoms of [peach] line-pattern [virosis] virus, particularly in the form of 'golden net', while white spot occurs sporadically; neither is of any importance.

At the moment nutrient deficiencies, e.g., boron in apple, pear, and olive, potash and phosphorus in peach and cherry, and zinc and magnesium in citrus, are the object of more intensive research than virus diseases, the economic significance of which is generally either limited or unknown. A map shows the distribution in Italy of both groups of disorders.

H. Thiem's observations [in German] (pp. 72–75) on fruit tree degeneration in western Germany [35, p. 683] were concerned with (1) the ubiquitous distribution of mosaic symptoms with a wide range of form, notably in large plum and cherry orchards [35, p. 372]; (2) the Pfeffinger disease of cherry; and (3) witches' broom of apple. Pears in proximity to cherries and plums are also affected by banding and flecking, while the crown of a Beauty of Boskoop apple was white with aucuba mosaic, which did not, however, reduce the yield.

Details are given of the distribution of Pfeffinger disease in west German cherry orchards. It is most prevalent in the neglected plantings of the Lower Main area, which may have to be abandoned. The virosis was also observed, however, on thrifty Fromms Blackheart trees in Upper Bavaria. Scions of Hedelfingen, Schmalfelds Black, and other varieties on the infected trees developed the typical Pfeffinger symptoms after two years. The disease has also been recorded elsewhere, e.g., at Heidelberg and Bonn, and was observed by the author at Fagersta, about 200 km. north-west of Stockholm, Sweden.

Among the apple varieties planted (mostly on rootstock II) in the spring of 1942 in the experimental field of the Biological Institute, Heidelberg, which showed witches' broom symptoms at an inspection in the autumn of 1951, were Landsberger Rienette, Berlepsch, Beauty of Boskoop, Laxton's Superb, Golden

Pearmain, Signe Tillisch, Blenheim Golden Pippin, and Cox's Orange. Although statistics are lacking, the virosis appears to be on the increase, being very prevalent, for instance, on the western slopes of the Bergstrasse on the Loti variety, a relative of White Transparent, alleged to be of United States origin.

D. Stanković, of the Agricultural Faculty, Belgrade, Yugoslavia, outlined (pp. 76–79), with 59 references to the relevant literature, a proposed new method for the breeding of virus-resistant fruit trees, based on the modification of inherited characteristics through the operation of nucleic acids on the biochemical processes of the cells of the gametangia and the young embryo.

The organization of field inspection and certification for freedom from virus diseases in Holland was described (pp. 79–82) by P. H. Van de Pol, while particulars of a supplementary indexing scheme for the supply of virus-free planting material to fruit-growers, based on that of Posnette and Cropley [34, p. 729], were contributed (pp. 83–85) by C. A. R. Meijneke.

A report of a concluding discussion on international European co-operation in fruit tree virus research was made (pp. 85–87) by C. A. R. Meijneke and D. Mulder.

A. E. Posnette, C. A. R. Meijneke, and D. Mulder, representing the European Committee for Co-operation in Fruit Tree Virus Research, established in consequence of the above-mentioned discussion, presented (pp. 87–88) a suggested standard minimum range of indicator varieties for European viroses.

Foulds (R. M.), Hey (G. L.), & Hunnam (D.). **Low volume sprays for pest and disease control.**—*Grower*, 43, 16, pp. 941, 943, 945, 1955.

The writers give general advice on the low-volume spraying of fruit trees [in England: *R.A.M.*, 35, pp. 469, 684]. Materials for 50 gals. per acre should be used at two and a half times the amount in 100 gals. dilute wash (i.e., high volume spray). Lime-sulphur should be applied at 5 gals. in 50 gals. per acre on Bramley, Worcester, and Laxton's Superb apples as a pre-blossom spray, reducing to $2\frac{1}{2}$ gals. during bloom and subsequently. In Cox's Orange orchards intolerant of lime-sulphur the lower rate should be used until bloom, then wettable sulphur at 10 lb. in 50 gals. Where scab [*Venturia inaequalis*] is serious a mercury spray is better than wettable sulphur. Suggested spray rates for a number of proprietary compounds are tabulated.

Bollard (E. G.). **Trace-element deficiencies of fruit crops in New Zealand.**—*Bull. N.Z. Dep. sci. industr. Res.* 115, 52 pp., 35 figs., 1955.

The first part of this comprehensive bulletin deals with the nature and occurrence of trace element deficiencies in general, their detection and treatment, and the various techniques and methods involved. Subsequent sections deal with the effects of boron, manganese, and zinc deficiencies of fruit crops in New Zealand [*R.A.M.*, 35, pp. 613, 614], their symptoms, importance, and treatment. Lists of references accompany each section, and the whole is well illustrated.

Swales (J. E.) & Williams (K.). **Non-ionic surfactants in concentrate mixtures for the control of Apple scab.**—*Canad. J. agric. Sci.*, 36, 1, pp. 36–40, 1956.

In 1954 experiments were conducted at Sunshine Bay, British Columbia, to determine the effect of surfactants of fungicidal concentrate spray mixtures for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, 35, p. 462]. The two non-ionic surfactants, triton B-1956 and C.S.M. (colloidal spray modifier) both improved the effectiveness of the sprays. Adding triton B-1956 and C.S.M. (both at 0·8 qt. per acre) to lime-sulphur (8 gals.) pre-pink, pink, and full bloom sprays and to the four cover sprays, ferbam (76 per cent. wettable powder at 5 lb.) and wettable sulphur (15 lb.), reduced average infection on the fruit from 11·7 (fungicides alone)

to 4·1 and 4·3 per cent., respectively, as against 100 per cent. infection for the untreated. Applying ferbam and wettable sulphur in all the sprays resulted in 13·5 per cent. average infection, which was reduced to 7·7 per cent. by adding triton B-1956. Colloidal sulphur (25 lb.) plus triton B-1956 in the pre-pink, pink, and full bloom sprays and with an addition of ziram (76 per cent. wettable powder, 5 lb.) in the four cover sprays resulted in 12·5 per cent. infection. This was largely due to the ineffectiveness of colloidal sulphur in checking the disease during the rather cool, early part of the season. This latter spray caused the least injury to the plant, but in general the use of surfactants increased spray damage, though it may be possible to reduce this by using 50 gals. spray liquid per acre rather than 75 as at present.

Hirst (J. M.), Storey (I. F.), Ward (W. C.), & Wilcox (H. J.). **The origin of Apple scab epidemics in the Wisbech area in 1953 and 1954.**—*Plant Path.*, 4, 3, pp. 91–96, 1 pl., 4 graphs, 1955.

The difficulty of controlling apple scab (*Venturia inaequalis*) round Wisbech, where Bramley's Seedling has now become susceptible [*R.A.M.*, 32, p. 82], is probably due to the development of a specialized race of the fungus. In the springs of 1953 and 1954 at Wisbech St. Mary an automatic volumetric spore trap [31, p. 618] caught no conidia between March and May in either year. In both years there was evidence that the number of ascospores present was sometimes influenced by the time of day when rain fell [cf. 35, p. 586]. Few were trapped during the first hour after the onset of rain during the day; in the second hour the number increased, usually reaching a peak in the third hour; thereafter the figure declined, and after eight hours the catch was again small. Only exceptionally were two heavy catches of ascospores made in 24 hours, a fact suggesting that all mature asci release their spores soon after rain has started, an interval then being necessary before other perithecia mature.

The first lesions were found on 28th April, 1953, and 24th May, 1954, three to four weeks after spores had first been liberated in large numbers shortly after bud-burst [cf. 6, p. 299]. Both years were marked by long periods without rain in early spring. Asci continued to mature during the dry weather, and the first considerable rain produced the heaviest concentrations of ascospores recorded. This emphasizes the danger of assuming that dry weather checks scab and renders spraying unnecessary. With protective sprays, the longer the dry period, the more important it is to cover the foliage before the rain starts.

All the evidence indicated that plenitude of ascospores early in the season was responsible for the early outbreaks of scab. To prevent infections at bud-burst, sprays must either be applied earlier than at present or be capable of eliminating established infections.

Byrde (R. J. W.). **The varietal resistance of fruits to brown rot. I. Infection experiments with Sclerotinia fructigena Aderh. & Ruhl. on certain dessert, culinary and cider varieties of Apple.**—*J. hort. Sci*, 31, 3, pp. 188–195, 1 graph, 1956.

Resistance to brown rot (*Sclerotinia fructigena*) following surface wounding and inoculation was studied at Long Ashton on 11 representative apple varieties. Two types of resistance were observed, of which the first, exhibited by Edward VII and to a lesser extent by Bramley's Seedling and Kingston Black, was to mycelial spread in an established infection. The second, characteristic of the cider varieties Yarlington Mill, Chisel Jersey, and Dabinett, which are resistant to the disease in the orchard, was that of injured tissue to initial infection by spores. Resistance of the first type may be akin to that described by Mittman-Maier [*R.A.M.*, 21, p. 460] and result from the inhibition of a fungal pectolytic enzyme by a fruit

constituent [35, p. 385]. That of the second showed a correlation with the rate of browning of injured tissue, but the exact significance of this remains to be discovered.

Müller (R.). **Maßnahmen zur Förderung der Erntemengen und Qualität durch Bekämpfung des Apfelmehltaues.** [Measures to improve yield and quality by the control of Apple mildew.]—*Mitt. ObstbVersAnst. Jork*, 1955, 5, pp. 135–140, 3 figs., 1955.

The author reports experiments at the Fruit Research Station, Hohenheim, Germany, on the control of apple mildew [*Podosphaera leucotricha*] with wettable sulphur [*R.A.M.*, 34, p. 575]. He concludes that successful control depends on the application of a rigid schedule from the end of flowering until the end of shoot growth. During this period the spraying intervals should at first be from eight to ten days, later increasing to 12 to 14 days. Thorough wetting of the lower surfaces of the leaves is essential.

Blumer (S.). **Winterkälte und Apfelmehltau.** [Winter cold and apple mildew.]—*Schweiz. Z. Obst- u. Weinb.*, 65, 14, pp. 308–309, 1956.

In a brief note the author discusses the possibility that the spread of apple mildew [*Podosphaera leucotricha*] in Switzerland [*R.A.M.*, 32, p. 260] in recent years is the result of warmer winters. This belief finds support in the observation that, following the cold winter of 1955–6, mildew attacks were much reduced, presumably because infected buds containing overwintering mycelium were mostly killed, whereas healthy buds are able to withstand the cold.

Dye (D. W.). **Suggestions for controlling blast of stone fruit.**—*Orchard. N.Z.*, 29, 4, pp. 2–3, 1956.

Based on the results so far obtained in spraying trials still in progress, the following suggestions are made for the control of blast [*Pseudomonas syringae*: *R.A.M.*, 35, p. 282] of stone fruits, mainly apricot and peach, in New Zealand.

Nursery trees (whether stocks or budded trees) should be sprayed at early bud movement with 10–8–100 Bordeaux mixture, and ten days later with 6–8–100. About 28 days after early bud movement and again 14 days later streptomycin sulphate 100 p.p.m. (available in the proprietary products agrimycin 100 and streptospray) should be applied, with further applications at 14-day intervals if necessary. In late March and early April at least two applications of streptomycin should be given at intervals of seven to 14 days; as soon as leaf fall begins at least five applications should be made at intervals of not more than seven days. If cool, wet, or stormy weather prevails, and especially if leaf fall begins suddenly, the intervals should be five days and the number of sprays increased. When leaf fall is complete the trees should be sprayed with 6–8–100 Bordeaux. Trees budded the previous summer should be headed back to remove stock growth that may be carrying infection, and then sprayed with 10–8–100 Bordeaux at intervals of approximately 28 days until bud movement, while those for despatch during winter should be sprayed at 14-day intervals.

As soon as trees are received from the nursery they should be planted, pruned, and sprayed with streptomycin. Applications of 6–8–100 Bordeaux should be made at intervals of 28 days until bud movement, but if infection becomes apparent the affected parts should be removed and streptomycin applied instead at intervals of 14 days. From early bud movement the spray programme should be similar to that recommended for nursery trees.

If infection appears during the second spring after planting, all diseased parts should be removed and the first-year spray schedule repeated. If not, spraying can be reduced as follows: at bud movement, 10–8–100 Bordeaux; seven and 21 days after petal fall and early April, streptomycin; beginning at early leaf fall, three

applications of streptomycin at 7- to 10-day intervals; at complete leaf fall and at 28-day intervals until bud movement, 6–8–100 Bordeaux. As the trees age this programme can be reduced by omitting first the two post-blossom sprays, then the pre-leaf fall ones, and finally the bud-movement and winter sprays.

Ciferri (R.), Rui (D.), Cosolo (A.), Hugues (M.), & Monica (A.). **Interventi con palo iniettore in pescheti leptonecrosati.** [Treatments with the soil-injector in Peach plantings affected by leptonecrosis.]—*Notiz. Malatt. Piante, 1955*, 33 (N.S. 12), pp. 41–47, 1955.

In 1952, 1953, and 1954 the soil round peach trees (four to eight years old) growing at Fogliano, Gorizia, Italy, which had shown rather serious symptoms of non-parasitic leptonecrosis [*R.A.M.*, 35, p. 304] since 1947, was treated with 10 to 15 per cent. solutions of ammonium phosphate and potassium sulphate applied at a rate of some 20 l. per tree by means of a soil-injector. Satisfactory results were obtained on individual trees, but further work is required before it can be decided whether the method is suitable for general use on a field scale.

Crosse (J. E.). **Bacterial canker of stone fruits II. Leaf scar infection of Cherry.**—*J. hort. Sci.*, 31, 3, pp. 212–224, 4 pl., 1956.

In further work on bacterial canker (*Pseudomonas mors-prunorum*) of cherry [*R.A.M.*, 34, p. 769; 35, p. 198] at East Malling bacterial inoculum was placed in late October on the uninjured surfaces of leaf scars resulting from the forcible removal of the leaves or from normal abscission accelerated by cutting off the leaf blade. The resultant infections, which were observed in stained sections of the fruiting spurs, produced by the following May symptoms and varietal reactions similar to those occurring naturally.

The pathogen penetrates into the vascular system, and thence to the living tissues of the stem and of the branch. There is no evidence of direct penetration into the vessels of the branch. The manner of breakout from the vessels was not ascertained, but initial colonization of the living tissues was observed to be intercellular, and the killing of living cells in advance of penetration was a consistent and conspicuous feature. This suggested the activity of an endotoxin similar to that occurring in bacterial canker of plum [24, p. 454].

When inoculum was applied immediately after removal of the petiole it was sucked rapidly into the leaf trace vessels of the scar. Experiments with stains and with stained bacterial suspensions revealed that the depth of initial penetration of the latter rarely exceeded 5 mm. and that penetration decreased with increasing scar age, being negligible after 48 hours. The susceptibility of scars also appeared to be related to the amount of inoculum. In prolonged rain absorption of the organism may be continuous, leading to the accumulation of bacteria in considerable numbers in the vessels. Wind-driven rain, simultaneously removing the leaves and distributing inoculum, would appear to be ideal for infection, but leaf removal and the arrival of inoculum need not coincide, so that considerable infection might occur during normal rain following a dry windy day.

Kunze (L.). **Ein Enationsvirus an Sauerkirsche.** [An enation virus of Sour Cherry.] —*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, 8, 4, pp. 58–59, 2 figs., 1956.

The author describes the Stecklenberg disease of sour cherry [? a strain of necrotic ring spot: *R.A.M.*, 35, p. 373 and above, p. 774], and records the transmission of the enation symptom of Thiem [33, p. 162] by the grafting of infected sour cherry on to one-year seedlings of *Prunus avium*, and two-year seedlings of sweet cherry (var. Hedelfinger) and *Prunus mahaleb* at the Virus Research Institute, Berlin–Dahlem. The leaves also developed flecks, rings, and banding, symptoms similar to those of Stecklenberg disease.

Stubbs (L. L.). **Diseases of Strawberries.**—*J. Agric., Vict.* (formerly *J. Dep. Agric., Vict.*), 54, 5, pp. 232–236, 9 figs., 1956.

All the commercial strawberry varieties in Victoria except the recently introduced Auchincruive Climax are generally infected with one virus or more [*R.A.M.*, 34, p. 97]. The symptoms produced by two of these viruses in varieties commonly grown in Victoria are mild or unrecognizable. The mild virus resembles strawberry mottle [33, p. 306] and the other may be strawberry leaf curl virus [32, p. 573], probably introduced with the Ettersburg varieties from California. Severe crinkle (resulting from infection with these two viruses and strawberry crinkle virus) [loc. cit.] appears to be largely responsible for the degeneration now manifest throughout Victoria. At present, virus-free plants of several varieties introduced from England and America are in quarantine at the Plant Research Laboratory, Burnley. When enough healthy plants are available they will be used to initiate a certification scheme.

A root-rot condition [34, p. 98] caused considerable losses in the Dandenong Ranges, particularly during and after the extremely wet winter of 1952 and the following season. In most cases the symptoms resembled those of calcium deficiency, though there was no response when hydrated lime was applied in the field at up to 5 tons per acre. Plants deliberately selected for extensive root rot recovered completely when grown in sand watered with a nutrient solution containing all the elements needed for plant growth.

In spray trials zineb (2–100) gave better control of leaf spot (*Mycosphaerella fragariae*) [23, p. 378] than Bordeaux mixture, captan, thiram, or ziram. At 0·005 per cent. phenyl mercury chloride caused leaf chlorosis and stunting.

Pettersson (S.). **Karathane WD, ett nytt medel mot mjöldagg.** [Karathane WD, a new remedy for mildew.]—*Växtskyddsnotiser, Stockh., 1956*, 1–2, pp. 26–28, 1 fig., 1956.

In 1955 excellent control of gooseberry mildew [*Sphaerotheca mors-uvae*] on the Bloodhound and White Champagne varieties was obtained in experiments organized by the Swedish Plant Protection Institute by spraying with karathane WD [*R.A.M.*, 35, p. 376 and next abstract], giving four applications at a strength of 0·12 per cent. between 2nd May and 4th July. Apple mildew [*Podosphaera leucotricha*] was virtually eliminated by three treatments (on 2nd, 22nd, and 29th June) with a mixture of 25 per cent. karathane WD and 75 per cent. of a zineb preparation known as De Zäta 78. Karathane was also effective against [unspecified] mildews of ornamentals, including rose, chrysanthemum, and *Viola cornuta*.

Ruehle (G. D.). **A note on powdery mildew of Mango.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 277–278, 2 figs., 1956.

Powdery mildew (*Oidium* sp.) has been present on mangoes in Florida for about 15 years [*R.A.M.*, 30, p. 51]. Up to 1954 it was observed chiefly on mature leaves and occasionally on fruits on unsprayed trees, but was unimportant in commercial groves sprayed against anthracnose [*Glomerella cingulata*: loc. cit.]. In 1954, however, mango bloom became seriously infected in many groves from Miami to Stuart. In 1955 the disease caused serious damage to blossom panicles in one grove on Merritt Island and injured flowers and foliage in other sections.

One grower reported that karathane WD [see preceding abstract] applied to the bloom at the rate of 0·5 lb. per 100 gals. (25 per cent. of active ingredient) appeared to be effective in 1954 and 1955. The same material, used at 0·6 lb. per 100 gals., gave apparently satisfactory results in another locality in 1955.

Volcani (Z.). **A strain of Pseudomonas isolated from diseased Banana plants.**—*Bull. Res. Coun. Israel*, 5, 1, pp. 70–72, 1 pl., 1955.

A strain of *Pseudomonas aeruginosa* [*R.A.M.*, 34, p. 438] isolated with other

organisms from diseased banana plants in the Jordan Valley caused lesions on citrus, avocado, tomato, and chilli fruits, on young pea pods, and on lettuce and tomato leaves, but not on banana. It killed mice within 24 hours of injection.

El-Helaly (A. F.), Ibrahim (I. A.), & El-Arosi (H. M.). **Studies on some factors affecting the prevalence and distribution of cigar-end disease of Banana in Egypt.**—*Alexandria J. agr. Res.*, 11, 2, pp. 9–24, 1955. [Abs. in *Bull. sci. tech. Docum. Cent.*, 1, 3, Part 2, p. 12, 1955.]

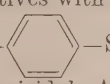
The writers note that cigar-end disease of bananas (*Verticillium theobromae*) [C.M.I. map No. 146] is commonly found in Egypt. Growth of the pathogen was best at 25° C.

Cohen (M.). **Clitocybe rot of Lychee trees.**—*Proc. Fla hort. Soc.*, 68 (*1955*), pp. 329–332, 3 figs., 1956.

The most important disease of litchi trees (*Litchi chinensis*) in Florida is mushroom root rot (*Clitocybe tabescens*) [*R.A.M.*, 31, p. 497], present on both the east and west coasts. It has killed 25 trees in one grove on Merritt Island and destroyed many in the Sarasota area. It is also present in Pinellas county and has been reported from others. The planting on Merritt Island, consisting of 325 trees planted in 1947, was established on land from which oaks and pines had recently been cleared. By August, 1955, 8 per cent. of the trees had been killed, and when the dead trees were removed, in at least one instance dead infected oak roots and a dead infected oak stump were found within a few feet of a dead litchi. The fungus had completely girdled the crown of every dead litchi tree found and had spread along all the branch roots to a distance of $3\frac{1}{2}$ to 7 feet.

Sites for new litchi plantings should either be selected in areas where oaks and other woody plants have not been present for many years or all oak stumps and roots should be completely removed before planting. Fumigation of the soil is being tried.

Uhlenbroek (J. H.). **Eine neue Klasse organischer Fungizide.** [A new class of organic fungicide.]—Abs. in *Angew. Chem.*, 67, 23 (*Beil.*), p. 764, 1955.

In a paper contributed to the 14th International Congress of Pure and Applied Chemistry, held at Zürich, Switzerland, from 21st to 27th July, 1955, the author reports from Weesp, Holland, the discovery of highly fungicidal properties within the group of trichloro-methyl-thiosulphonates. However, on account of their extreme phytotoxicity, they are inapplicable as plant protectives with the single exception of the *p*-carboxyphenyl derivative II: HOOC—  —$SO_2S.CCl_2$, which is harmless even at high concentrations and strongly fungicidal. At the time of writing it was being tested in the field [against unspecified fungi].

Brauns (A.). **Angewandte Biologie und Pflanzenschutz.** [Applied soil biology and plant protection.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 1, pp. 10–13, 1956.

In this paper, originally delivered in English at the International Colloquium on Soil Biology at Nottingham, April, 1955, the author outlines the development of applied soil science in recent years, with reference *inter alia* to soil ecological studies in forestry, the research required to devise well-founded rotations of trees and crops, and the relation of the humus status of the soil to the incidence of disease.

Gehring (F.). **Über die Einbettung von viruskrankem Pflanzenmaterial in Celodal.** [On the embedding of virus-diseased plant material in celodal.]—*NachrBl. dtsch. PflSchDienst* (*Braunschweig*), *Stuttgart*, 8, 2, pp. 22–24, 2 figs., 1956.

The author describes a method for the permanent preservation of leaves with

virus symptoms. A shallow glass tray, made from cemented glass, is half filled with a mixture of celodal (a Bayer product) and a setting solution, previously cleared of bubbles *in vacuo*. When the celodal is firm but still tacky the leaf is pressed on to it with a piece of weighted glass, then finely dusted with copper acetate powder to preserve the colour, and covered by a fresh mixture of celodal and setting solution, from which bubbles may be removed *in vacuo*. Glass is cemented over the tray. Celodal is sold in two forms, I and II. The former sets more rapidly and produces fewer changes in the leaves and is therefore preferable, even though it tends to form bubbles.

Sakaguchi (K.). **The activities of bacteria in the Soya-sauce fermentation. Part I. A method of viable counts of bacteria from the culture mixed with moulds and yeasts.**—*J. agric. chem. Soc. Japan*, 28, 9, pp. 758–764, 1954. [Japanese, with English summary.]

In studies at the Noda Industrial and Scientific Research Laboratory, Japan, the addition of eurocidin (30 to 100 γ per ml.), W–2 substance (25 γ), and trichomycin (500 γ) inhibited the growth of moulds and yeasts (including *Aspergillus*, *Mucor*, *Rhizopus*, *Penicillium*, *Saccharomyces*, *Zygosaccharomyces*, *Torulopsis*, and *Candida*) but not of bacteria. Eurocidin was more active in glucose-broth media than in Czapek's, and was unaffected by heating to 100° [? F.] for 15 mins. or by pH.

Schumann (G.). **Anwendung von Antibiotika im Pflanzenschutz.** [The use of antibiotics in plant protection.]—*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, 8, 5, pp. 73–78, 1956.

The author reviews the present position of research on plant protection by antibiotics [cf. *R.A.M.*, 35, p. 113] from a bibliography of 66 references.

Schrödter (H.). **Die Antibiotikawirkung im Pflanzenschutz ist wetterabhängig.** [The effect of antibiotics in plant protection is dependent on weather.]—*Umschau*, 56, 4, pp. 114–115, 1956.

Further information is presented concerning the influence of soil temperatures on the activity of culture filtrates of *Penicillium* [*chrysogenum*] and *Streptomyces* [*griseus*] and of pure penicillin in the control of halo blight [*Pseudomonas medicaginis* f.sp. *phaseolicola*] of bean [*Phaseolus vulgaris*] at the Agrarian-Meteorological Research Station, Aschersleben, Germany [*R.A.M.*, 34, p. 696]. The treatment was considerably more effective at temperatures round 10° C. than at those exceeding 20°. Antibiotic efficiency is influenced not only by temperature but also by 'heat-exchange', increasing parallel with the supply of energy. At a generally low temperature a current producing 100 cal. per sq. cm. daily suffices to release the maximum antibiotic activity.

Nakazawa (K.), Oki (K.), Tadokoro (I.), Honjo (M.), Hitomi (H.), & Ueyanagi (J.). **Studies on streptomycetes. Hygroscopin, an antibiotic substance active against fungi and phytopathogens.**—*J. agric. chem. Soc. Japan*, 28, 9, pp. 715–716, 1954. [Japanese, with English summary.]

In co-operative studies between Takeda Pharmaceutical Industries and the Institute for Fermentation, Osaka, Japan, crude hygroscopin produced by *Streptomyces hygroscopicus* inhibited the growth of *Aspergillus glaucus*, *Penicillium chrysogenum*, *Rhizopus nigricans* [*R. stolonifer*], *Monascus anka*, *M. purpureus*, *Alternaria tenuis*, *Dematium* [*Pullularia*] *pullulans*, *Cercospora oryzae*, *C. cruenta*, *Cercosporina* [*Cercospora*] *kikuchii*, *Corticium centrifugum*, *Colletotrichum atramentarium*, *C. glycines*, *Cercosporina anthelminthica* [*Cercospora beticola*], *Gloeosporium laeticola*, *Helminthosporium sigmoideum* [*Leptosphaeria salvinii*], *H. sesamum*, *Macrosporium bataticola* [*Macrophomina phaseoli*], *Ophiobolus miyabeanus*, *Piricularia oryzae*, *P. grisea*, *Phomopsis* [*Diaporthe*] *citri*, *Sclerotinia sclerotiorum*.

Sclerotium hydrophilum, *Septoria glycines*, *Ustilago zeae* [*U. maydis*], and *Phyllosticta phaseolina* at concentrations below 1 γ per ml.

SKINNER (F. A.). **Inhibition of the growth of fungi by Streptomyces spp. in relation to nutrient conditions.**—*J. gen. Microbiol.*, 14, 2, pp. 381–392, 2 pl., 1 diag., 1956.

Although many species of soil actinomycetes can produce antibiotics in culture when they receive adequate supplies of the right nutrients, it is by no means certain that they can form sufficient quantities to antagonize other micro-organisms in soil where the quality or quantity of nutrients may not permit rapid growth [cf. *R.A.M.*, 35, p. 475, and above, p. 759]. A study was made in the Soil Microbiology Department, Rothamsted Experimental Station, of the ability of five *Streptomyces* spp. to suppress the growth of *Fusarium culmorum* [see next abstract], *Rhizoctonia goodyerae-repentis* [29, p. 423], *Fusarium* sp., *Stemphylium* sp., and an unidentified sterile mycelium, particularly by the production of antibiotics, under conditions unfavourable to luxuriant growth.

The *Streptomyces* spp., notably *S. albido-flavus* [35, p. 213], arrested growth by antibiotic secretions on agar media containing 10 gm. glucose per l. With less glucose the fungi continued to grow in the presence of the actinomycetes though traces of antibiotics could still be detected. In sand moistened with a liquid medium containing glucose *S. albido-flavus* limited the early growth of *F. culmorum* by antibiotic action and also attacked pre-formed mycelium directly. The antagonism became less marked as the glucose concentration was reduced. The fungus and actinomycete grew together on media containing wheat straw, leaf mould, root fraction, farmyard manure, peat, and lignin, which were all able to inactivate to some extent any antibiotic formed from the plain agar base. Only when dried grass was used did *S. albido-flavus* arrest the growth of *F. culmorum* at a distance.

The following, hitherto neglected aspect is evident from these results. When carbon supplies and energy sources are low, conditions may be unfavourable not only for growth of a potential producer of an antibiotic but also for that of other micro-organisms susceptible to the antibiotic. The relative importance of such growth-limiting mechanisms as antibiotic production, nutrient competition, and direct attack by one organism on another at low nutrient concentrations requires considerably more detailed study [33, p. 629, and next abstract].

SKINNER (F. A.). **The effect of adding clays to mixed cultures of Streptomyces albidoflavus and Fusarium culmorum.**—*J. gen. Microbiol.*, 14, 2, pp. 393–405, 1956.

In view of the fact that clays frequently adsorb the antibiotics elaborated by most antibiotic-producing *Streptomyces* spp., rendering them inactive, they were used to distinguish between antibiotic action and competition for nutrients in further studies on antagonism between *Fusarium culmorum* [*R.A.M.*, 31, p. 255] and *S. albido-flavus* in the Soil Microbiology Department, Rothamsted Experimental Station [see preceding abstract]. In a sand-bentonite mixture moistened with nutrient solution and containing sufficient bentonite to inactivate the antibiotic, fungus growth was suppressed by the actinomycete, particularly with abundant glucose, probably owing to competition for limiting nutrients. *S. albido-flavus* also lysed the contents of the fungus mycelium in sand culture but not in the presence of bentonite. The lytic agent appeared to be distinct from the antibiotic. Although neither antibiotic action nor lysis could be demonstrated in sterilized soil, *S. albido-flavus* may sometimes be able, in certain soils, to produce sufficient antibiotic to affect the growth of *F. culmorum* or other fungi, and the same is true of other actinomycetes.

Byrde (J. W.) & Fielding (A. H.). **Studies on the acetylesterase of Sclerotinia laxa.**—*Biochem. J.*, 61, 2, pp. 337–341, 3 graphs, 1955.

This investigation, carried out at Long Ashton Research Station, Bristol, was further concerned with the hydrolysis of phenolic esters by enzyme preparations from *Sclerotinia laxa* [*R.A.M.*, 33, p. 543]. The presence was demonstrated of an acetylesterase in *S. laxa*, the activity of which towards phenolic esters of fatty acids decreased with increasing molecular weight of the side chain and was related to the nature of the phenolic nucleus. The esterase showed optimum activity at pH 7·8 and was relatively resistant to inhibition by diethyl *p*-nitrophenyl phosphate. Exocellular enzyme activity was demonstrated earlier in cultures on solid than on liquid media. The enzyme appears similar to type A serum esterases and would seem to be an important factor in causing the fungistatic activity of phenolic ester. Four components with esterase activity were separated chromatographically from the crude extract of *S. laxa*.

Goto (K.). & Fukatsu (R.). **Accumulation of starch around diseased spots.**—*Bull. Div. Pl. Breed. Tôkai-Kinki agric. exp. Sta.* 2, pp. 41–52, 9 figs., 1 graph, 1955. [Japanese, with English summary.]

The authors observed the accumulation of starch in the tissues round leaf spots caused by a large number of pathogens on a variety of hosts. The accumulation in brown spots on rice caused by *Ophiobolus miyabeanus* is immediately outside the venenate zone [*R.A.M.*, 16, p. 557] and is believed to be due to the stimulation of substances exosmosed from the diseased spot. Accumulation does not occur in chlorotic areas, as in variegated leaves, nor in mechanically wounded spots, and is greatest round young spots and on young leaves, decreasing with age. After four days' incubation in the dark it disappears. The starch is produced *in situ*, the accumulation being apparently due to retarded translocation rather than excessive photosynthesis.

Martin (C.) & Quemener (J.). **Sur un test colorimétrique et quelques symptomes permettant la détection des maladies à virus chez la Pomme de terre.** [On a colorimetric test and some symptoms permitting the detection of virus diseases in the Potato.]—*C. R. Acad. Agric. Fr.*, 42, 8, pp. 426–428, 1956.

The authors describe their use of 2–6-dichlorophenol-indophenol [*R.A.M.*, 34, p. 38; 35, p. 482] as a test on expressed sap from young shoots to detect virus infection of potatoes. The test was applied to 800 Bintje tubers (healthy or infected with virus X or Y), 100 tubers of Saskia or Ideaal (healthy or infected with virus Y), and a number of other tubers. The results were in 95 per cent. agreement with serological tests, and aberrations were mainly traceable to healthy plants which reacted positively. Preliminary trials suggest that the method may be useful for revealing virus A, which is at present not detectable by any simple test.

Observations have shown that virus infection is accompanied by anomalous pigmentation of the young shoots. When suitably grown, e.g., at 20° C. and 90 per cent. humidity in half light until they attain 3 to 4 cm., after which they are subjected to diffuse light (or daylight without direct sunlight) for three to four days, the shoots of healthy tubers have a regular and intense pink or violet pigmentation. On shoots from infected tubers it is irregularly distributed. By this means the presence of virus X or Y was diagnosed and confirmed serologically in 4,000 Bintje tubers. Symptoms of virus A in Viola and Saucisse were not so clear, necessitating the use of the binocular microscope. The possibility of detecting leaf roll virus is being investigated.

At present the indophenol test and shoot pigmentation diagnosis may be regarded as complementary to serological tests, but, being more rapid, they may replace them where identification of the virus is not required.

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